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Job Satisfaction of Teachers and their Principals in Relation to Climate and Student Achievement

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Abstract

Job satisfaction is important for employee well-being and retention, which are both crucial for high strained occupations such as teachers and school principals. We investigated the structure and relationship of teachers' job satisfaction ($N = 142,280$) and principals' job satisfaction ($N = 8,869$). Results of structural equation modeling using multilevel bi-factor models provide strong evidence for the validity of a model including both specific (satisfaction with the profession versus the working environment) and general job satisfaction factors. This differential conception of job satisfaction was further tested by including the student variables disciplinary climate and student achievement from linked TALIS 2013-PISA 2012 data. Only teacher job satisfaction factors (general and working environment) were related to the disciplinary climate perceived by students, whereas the working environment job satisfaction factor was related to student achievement for both teachers and principals. Controlling for socio-economic status reduced these estimates, but did not change the pattern of results.

Educational Impact and Implications Statement

High teacher and principal job satisfaction is associated with well-being, lower attrition, and better student outcomes. We investigated whether different aspects of job satisfaction of teachers and their principals are related to each other, to student achievement, and to disciplinary climate perceived by students. Results based on a very large representative sample revealed that job satisfaction with the working environment of both teachers and their principals is high when student achievement is high. The school's disciplinary climate was only related to satisfaction of teachers. These findings show how students, teachers, and principals influence each other and highlight the importance of targeting interventions and policies at the school.

Job Satisfaction of Teachers and their Principals in Relation to Climate and Student Achievement

Job satisfaction plays an important role in employee occupational well-being, motivation, and retention (Tett & Meyer, 1993). Providing a recent overview of research on job attitudes Judge et al. (2017) claimed that job satisfaction is: an assessment of the favorability of a job; multidimensional; and typically arrayed along a positive to negative continuum (see also Judge Hulin, & Dalal, 2012). Should we focus on a general job satisfaction or on specific and important aspects of the job? This question is still controversial with most research applying an either-or approach (e.g., Judge et al., 2012; Judge, Weiss, Kammeyer-Mueller, & Hulin, 2017; Marsh & Scalas, 2018). In an effort to re-conceptualize the issue, we investigate whether using models that allow researchers to account for both the facets and a global component of job satisfaction are most appropriate. While relevant for all occupations, understanding job satisfaction is particularly crucial in the high strain, high turn-over world of school teachers and principals (e.g., Darmody & Smyth, 2016; Dicke, Stebner, Linninger, Kunter, & Leutner, 2018; Riley, 2014, 2015, 2017). The structure and content of job satisfaction in these occupations, however, is unclear. Job satisfaction cannot be viewed in isolation, it is directly influenced by the working environment of school teachers and principals (Darmody & Smith, 2016; Skaalvik, & Skaalvik, 2011). We investigate if principals' and teachers' job satisfaction is mutually reinforcing, if the association between facets and a global factor of job satisfaction are the same for both occupation groups, and if these relationships are influenced by national contexts. We do this using a multigroup (32 countries in Table S3 in Supplemental Materials) multi-level model that accounts for the nested structure of teachers and their principal. In the present study we focus on two facets of job satisfaction that have been established as being very important for teachers and principals (Dinham & Scott, 1998; Sergiovanni, 1967), that is "satisfaction with the profession" (work

itself), and "satisfaction with the current work environment", a distinction similar to that of organizational and occupational commitment (Meyer, Allen, & Smith, 1993). Using these facets in the school context is particularly interesting as participants rate satisfaction of the same work environment but from multiple perspectives (different teachers) and different organizational levels (teachers and their principal). Satisfaction with the profession, however, reflects an individual state-of-mind. To further understand varied stakeholder perspectives of the same environment, we also consider the students' perspectives via student ratings of disciplinary climate and student achievement.

School climate is highly related to teacher and principal job satisfaction (e.g., Aldrige & Fraser, 2016; Collie, Shapka, & Perry, 2012). Research on the relationship between student achievement and principal and teacher job satisfaction, however, has produced inconsistent results ranging from significantly positive relationships to no relationship at all (see below for more details; Caprara, Barbaranelli, Steca, & Malone, 2006; Sealy, Perry, & DeNicola, 2016). Thus, the present research provides further insights in these complex relationships.

To explore these associations, we make use of the Organisation for Economic Cooperation and Development's (OECD) Teaching and Learning International Study (TALIS)-Programme for International Student Achievement (PISA) link which allows us to examine the relationship between a) teachers' and principals' job satisfaction; and b) disciplinary climate perceived by students and student achievement. The linkage of these three perspectives—students, teachers and principals—allows us to apply a holistic approach to both learning and well-being by considering the whole school environment concurrently. To the best of our knowledge our research is the first to examine the exciting relationship of principals, teachers, and student variables using the merged TALIS data set (principals and teachers) and the TALIS-PISA link (Austin, French, Adesope, & Gotch, 2017; Le Donne, Fraser, & Bousquet, 2016).

What is Job Satisfaction?

Within the realm of research that studies attitudes toward work, job satisfaction is the clear favorite, being the most studied construct compared to e.g., commitment, engagement or work affect (Judge et al., 2017). But Locke's (1969) question—What is Job Satisfaction?—remains contentious. There are numerous definitions of job satisfaction (for overviews see e.g., Aziri, 2011; Weiss, 2002). For example, Mincu (2015, p. 685) defines the construct as "a positive frame of mind that is reflected by the employee's opinion regarding work or the climate of his workplace" which is similar to the aforementioned definition by Judge et al. (2017) who state that job satisfaction is: an assessment of the favorability of a job.

Job satisfaction has repeatedly been identified as an important predictor for turnover and retention, and is highly correlated to employees' commitment (for a review see e.g., Holtom, Mitchell, Lee, & Eberly, 2008; Hom & Kinicki, 2001; for meta-analyses see e.g., Griffeth, Hom, Gaertner, 2000; Meyer, Stanley, Herscovitch, & Topolnytsky, 2002).

An important aspect in the aforementioned definition is multidimensionality. Indeed, research distinguishes between overall job satisfaction in a general sense and specific facets of job satisfaction (e.g., Judge et al., 2012; Marsh & Scalas, 2018; Snipes, Oswald, LaTour, & Armenakis, 2005). In this research, some facets are tended to be viewed as more important than others (due to a stronger correlation with overall job satisfaction). Judge et al. (2012) for example distinguish pay, promotion opportunities, coworkers, supervision, the overall organization, and the work itself as the most important components of job satisfaction. Existing research points to disadvantages of using narrowly defined facets of the unique aspects of different jobs. Research on the related area of work commitment shows that there is good evidence to separate affective evaluations towards the organization versus the occupation (Meyer et al., 1993). Yet, others doubt the usefulness for such distinctions. Sceptics claim that any such facets would naturally inform an overall measure and thus it is the total of job satisfaction that matters (Weiss, 2002). The debate continues, and given the matter is complex, it may not be resolved by an either-or perspective. To make things even

more complicated the "overall" job satisfaction could be operationalized as either a relatively unidimensional single scale or a summative score (perhaps weighted by importance) based on specific facets (Marsh & Scalas, 2018). Some meta-analytic research shows that overall job satisfaction has stronger relationships with commitment and turnover intentions than specific facets of job satisfaction (Griffeth et al., 2000; Meyer, et al., 2002). Another meta-analysis by Tett and Meyer (1993) revealed no differences in the strength of the relationships of specific aspects of job satisfaction versus overall job satisfaction. In fact, the specific and general measures were both strong predictors of employee retention. Thus, a synthesis may be required between global perspectives and facet perspectives and it is of great interest to compare the different relationships of general and specific factors with other occupational outcomes.

Teachers' and School Principals' Attrition; School, a Crucial Environment for Studying Job Satisfaction

Teaching is internationally associated with particularly high levels of strain (Dicke, Stebner, et al., 2018; Dupriez, Delvaux, & Lothaire, 2015). This strain often results in attrition and research shows that almost a third of teachers leaves the teaching profession within the first five years in many countries (Chang, 2009; Ingersoll, 2012; Gallant & Riley, 2017; Jalongo & Heider, 2006)—it is thus, of utmost importance to investigate job satisfaction as an important factor within retaining school personnel. These high attrition rates of teachers are associated with high financial costs for further recruiting and disruptions of program continuity and planning. They are also associated with decreased student achievement (for an overview see Ronfeldt, Loeb, & Wyckoff, 2013). Teacher attrition is thus a critical factor impacting upon school effectiveness.

Teacher attrition is an important and frequently researched area (Dicke et al., 2014; Dicke, Parker, Holzberger, Kunter, & Leutner, 2015; Dicke et al., 2016; Dupriez et al., 2015; Gallant & Riley, 2014). Specific research on school principals' occupational well-being and

attrition, however, is still scarce (Darmody & Smyth, 2016; but see Dicke, Marsh, Riley et al., 2018). Those studies that have been dedicated to school principals report increasingly high levels of strain resulting in a shortage of qualified principals (see e.g., Darmody & Smyth, 2016; Dewa, Dermer, Chau, Lowrey, Mawson, & Bell, 2009; Grissom, Loeb, & Mitani, 2015; Riley, 2014, 2015, 2017). Increasing principal strain leads to greater attrition, which is exacerbated by an increasing reluctance of experienced teachers to "step up" to the role of leader (see Gates, Ringel, Santibanez, Guarino, Ghosh-Dastidar, & Brown, 2006; Miller, 2013). Thus, retiring principals are being replaced by younger, less experienced teachers who are potentially more at risk of experiencing the negative impacts of the role (Darmody & Smith, 2016; Kuper & Marmot, 2003; Riley, 2014, 2015; Riley & Langan-Fox, 2013).

Overall, international research agrees that low educator occupational well-being indeed seems to be a problem (e.g., Dicke, Marsh, Riley et al., 2018). Research on the relationship of principals and teachers (and their influence on students) however, is still in its beginning (Price & Moolenaar, 2015) and needs to be tested for country and cultural differences (Lee & Hallinger, 2012; Gao, Xia, Shen, & Ma, 2018). Studies on the effects of school leadership on school effectiveness and thus, teacher and student outcomes, however indicated similar effects across different cultural contexts (Dutta & Sahney, 2016; for an extended overview see Hallinger, 2011).

The findings of these studies are particularly alarming considering that school leadership is as crucial to an effective school environment that fosters students' learning as the impact of teachers themselves (Day, 2011; Leithwood & Lewis, 2012; Price & Molenaar, 2015). Furthermore, school leaders recognize, promote, and build the leadership capacity of staff, students, parents, and the community, and research has demonstrated the importance of school leaders for teachers' well-being (Collie, Granziera, & Martin, 2018; Shen, Leslie, Spybrook, & Ma, 2012). Given their relative numbers, one principal vs. 10s-100s of teachers,

it is arguable that principals may have far more influence on student learning than teachers per capita, albeit indirect. Principals also have a direct influence on teacher well-being (Gallant & Riley, 2013). In turn, teacher well-being is related to student achievement (Arens & Morin, 2016; Collie & Martin, 2017; Klusmann, Richter, & Lüdtke, 2016) and motivation (Shen et al., 2012). Moreover, research indicates a relationship of principals' behavior and student achievement (Darmody & Smyth, 2016) as well as students' well-being in school (Sebastian & Allensworth, 2012). Overall, these findings indicate the importance of investigating both teachers' and principals' job satisfaction in the school environment.

Job satisfaction for teachers and school principals in schools. One of the most important predictors for high teacher commitment and retention is teacher job satisfaction (Skaalvik & Skaalvik, 2010; 2017). Naturally, specific facet vs. overall job satisfaction has been discussed in the area of teachers' job satisfaction (Skaalvik & Skaalvik, 2011, 2017). Although teacher job satisfaction has been measured as both facet specific job satisfaction and overall job satisfaction, Skaalvik and Skaalvik (2011) caution that facet specific measures do not take into account individual differences with which teachers weigh the importance of specific facets of job satisfaction, thus underestimating possible overall effects.

In the present study we focus on general job satisfaction as well as two facets of job satisfaction that have been rated as very important for teachers and principals (Sergiovanni, 1967), being "satisfaction with the profession" (work itself) and "satisfaction with the current work environment". It appears that many studies seem to offer a mix of these facets in their general job satisfaction measures for teachers and principals (e.g., Aldrige & Fraser, 2016; Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2015). However, satisfaction with the profession exclusively focusses on the general satisfaction with the chosen profession/occupation. This raises the question as to whether one is satisfied being teacher (or principal) irrespective of one's current workplace and colleagues. Satisfaction with the current work environment on the other hand assesses your workplace, including aspects such as relationships with

colleagues. This distinction parallels the established differentiation of organizational and occupational commitment (Meyer et al., 1993). Further, separating satisfaction with the profession from satisfaction with the work environment is particularly interesting within the multilevel school context. Thus, it would be possible to view satisfaction of the same work environment from multiple perspectives (different teachers) and different organizational levels (teachers and their principal). Satisfaction with the profession, however, reflects an individual state-of-mind.

Variables related to teacher and principal job satisfaction. Teacher job satisfaction has been linked to teacher self-efficacy (Schwerdtfeger, Konermann, & Schonhofen, 2008; Wang, Hall, & Rahimi, 2015) and school principals' leadership behavior (Griffith, 2004; Littrell, Billingsley, & Cross, 1994). Shen et al. (2012), however, found school process variables such as career, working conditions, staff collegiality, and administrative support were stronger predictions on teacher job satisfaction. Skaalvik and Skaalvik, (2011, 2017) similarly found variables of the school environment, particularly a supportive social climate to be related to job satisfaction, which stresses the importance of the school climate for teachers (see also Aldrige & Fraser, 2016; Collie et al., 2012; Taylor & Tashakkori, 1995). Thus, satisfaction with the school environment should play a major role in keeping teachers at school. Similarly, Darmody and Smith (2016) found better quality school environments also foster school principals' job satisfaction. This is consistent with findings of several meta-analyses and numerous empirical studies showing a link between organizational climate and job satisfaction in various occupations (e.g., Carr, Schmidt, Ford, & DeSchon, 2003; Parker et al., 2003). As climate has been related to student achievement (MacNeil, Prater, & Bush, 2009) and teachers and principals are important for a productive learning environment (Collie & Martin, 2017; Darmody & Smyth, 2016), it would be natural to assume that job satisfaction is also related to student achievement. Currall, Towler, Judge, and Kohn (2005), using a large sample of 6000 American teachers, show pay satisfaction was positively related to academic

performance. Sealy et al. (2016), using TALIS and PISA data, similarly found that principals' job satisfaction with the environment was related to student achievement, but only in few countries. However, Caprara et al. (2006) found no such relation for teachers. The latter study relied on an overall measure of job satisfaction. Again, whether job satisfaction is best articulated as a single global factor, a set of facets, or both, remains critical.

The Present Study

The aims of the present study were threefold. First, we investigated the structure of job satisfaction in teachers and principals. Second, we investigated the relationships between teachers' and school principals' job satisfaction and tested if these were the same over 32 countries. Finally, we looked at relationships of teacher and principal job satisfaction with disciplinary climate as perceived by students as well as student achievement over those eight countries that participated in the TALIS-PISA link. We used a novel approach for achieving these aims, by using multiple informants to increase validity, a multilevel factor structure to appropriately control for the nested structure of principals, teachers, and students, and multigroup comparisons to ensure the cross-cultural generalizability of results.

Structure of teacher and principal job satisfaction. Our literature review suggests that the structure of job satisfaction remains elusive. The TALIS data has adopted such a multidimensional definition of job satisfaction by differentiating between Satisfaction with the current work environment, similar to organizational commitment, and Satisfaction with the profession, similar to occupational commitment (TALIS Technical Report by OECD, 2014). As we show above, researchers need not settle for a global focused conception of job satisfaction. Rather, job satisfaction may be better represented by both. Thus, in the present study we test such a bi-factor structure of job satisfaction, with two specific factors i.e., Satisfaction with the current work environment and Satisfaction with the profession, and a general job satisfaction factor for both principals and teachers. A bi-factor model, will allow us to test differences in the relationships of a general job satisfaction factor and specific job

satisfaction factors with relevant occupational outcomes (e.g., academic achievement).

Moreover, we can test differences in the relationships of these outcomes with both specific

factors. This resulted in our first hypothesis:

Hypothesis 1 (H1): A bi-factor model of job satisfaction, including the two specific

factors and a general factor, will result in better model fit and will result in a

practically significant increase in the R-squared of the manifest items than a two-

factor model for teachers and principals separately.

Relationships between teacher and principal job satisfaction: Invariance over

countries. A bi-factor approach of job satisfaction enabled us to adequately look at

relationships between the different factors of job satisfaction. Moreover, the complex

structure of the TALIS data, where teachers were nested in schools allowed us to look at these

relationships for teachers and their principals. This is important as research has shown that the

principal plays an important role in the formation of teacher job satisfaction (Griffith, 2004)

and early career teacher attrition (Gallant & Riley, 2014, 2017). Additionally, this tests the

validity of the factors as it is most plausible to assume that matching factors should correlate

highest. We expected this to be the case particularly for the association between satisfaction

with the current work environment for teachers and the principal. This is because both groups

work in the same school and naturally share the same working environment. Finally, the

additional nesting of data within in countries enabled us to test if this pattern of results was

invariant over the 32 countries that participated in the TALIS study. Thus, our third and fourth

hypotheses were as follows:

Hypothesis 2 (H2): In support of the convergent and discriminant validity of the three

job satisfaction factors, matching factors (e.g., teacher satisfaction with the current work

environment with principal satisfaction with the current work environment) would be more

highly correlated (convergent validity) than will non-matching factors (e.g., teacher

satisfaction with the current work environment with principal satisfaction with the profession;

divergent validity). Among the matching correlations, satisfaction with the current work environment would be highest.

Hypothesis 3 (H3): This pattern (H2) of results would be invariant over all 32 countries that participated in the TALIS survey.

Relationship of job satisfaction, disciplinary climate, and student achievement. Another feature of the present study was the ability to examine relationships of job satisfaction with disciplinary climate and student achievement. Based on the available literature, we included disciplinary climate and student achievement outcomes (Currall et al., 2005; Skaalvik & Skaalvik, 2011, 2017). With reference to the present study we assumed that Satisfaction with the current work environment would show the strongest positive relations to a good disciplinary climate and student achievement. Finding interrelationships of all three levels is of particular importance as it highlights the necessity to take into account a holistic model of the school environment, where changes on one level, for example teacher satisfaction, affects all other levels in this system, e.g., principal satisfaction and student achievement. Finally, we controlled for possible confounding effects of socioeconomic status. Hence, our fourth and last hypothesis was:

Hypothesis 4 (H4):

a) Satisfaction with the current work environment will be most positively related with good disciplinary climate reported by students, while we leave as an open research question which of the other two job satisfaction factors is related more strongly to the disciplinary climate.

b) Satisfaction with the current work environment will be most positively related to student achievement, while we leave as an open research question which of the other two job satisfaction factors is related more strongly to student achievement.

c) Disciplinary climate reported by students should be positively correlated with student achievement.

Method

Participants

Participants were 142,280 teachers and 8,869 school principals from 32 countries that were part of the TALIS sample (H1-3). Teachers were nested in schools and therefore principals, with on average 16 teachers per school principal (minimum of 1 teacher per school and a maximum of 53 teachers per school; see Table S1 in Supplemental Materials). Schools in turn were nested in countries with an average of 277 schools per country (minimum 116 and maximum 1070 schools per country). Teachers were 66.2% female and were on average 42.88 years old ($SD = 10.4$) with an average teaching experience of 16.23 years ($SD = 10.34$). School principals were 50.5% female and were 50.65 years old on average ($SD = 9.02$) with an average tenure as a principal for 9.02 years ($SD = 7.31$) and experience as a teacher for 20.31 years ($SD = 9.73$). Furthermore, student data were used from the eight countries that were part of the TALIS-PISA link (see below; i.e., Australia, Finland, Latvia, Mexico, Portugal, Romania, Singapore, Spain). Students were 50.5% female, and 58.5% of them were in Grade 10 ($M = 9.59$, $SD = .69$). On average, students' academic performance (based on the result of the PISA 2012 performance test for the eight countries included in the present study; including reading, mathematics, and science) was 475 ($SD = 92.4$). PISA results are based on a test that, in the first PISA cycle (i.e., PISA 2000), has a mean of 500 and a standard deviation of 100.

Data Linkage between TALIS 2013 and PISA 2012 (H4)

For H4 the present study linked TALIS 2013 data to PISA 2012. This linkage was only possible for those eight countries (i.e., Australia, Finland, Latvia, Mexico, Portugal, Romania, Singapore, Spain) that participated in the TALIS-PISA Link option (for details see OECD, 2014).

Due to the nature of the TALIS and PISA data it was only possible to merge the data at the school level (for details see Austin et al., 2017; OECD, 2014). That is, student data could not be linked to a specific teacher, only to a specific school. Thus, we linked the two

sources by aggregating PISA student data at the school level and merging this data with the TALIS data.

Measures

Job satisfaction. The present study included two job satisfaction scales from the TALIS—satisfaction with the profession and satisfaction with the current work environment—which were answered by teachers and principals who received parallel worded items of these scales (for all item wordings see Supplemental Materials; for more details see TALIS technical report – OECD, 2014). One scale targets the satisfaction with the occupation (i.e., as a teacher or a school principal), while the other scale targets the satisfaction with the current work environment (i.e., school). The two-factor structure was developed through confirmatory factor analyses and invariance testing (OECD, 2014). All items in both scales were measured on a four-point scale from "strongly disagree" to "strongly agree".

Satisfaction with the profession. The satisfaction with the profession scale included three items (e.g., "If I could decide again, I would still choose to work as a teacher/school principal"). The reliability for the school principal and teacher version of this scale was above .70 overall.

Satisfaction with the current work environment. The satisfaction with the current work environment scale consisted of four items (e.g., "I enjoy working at this school"). The reliability for the school principal version as well as for the teacher version was above .70 overall.

Moreover, we included two PISA scales*:* disciplinary climate and achievement scores, which both were based on student data only (for all disciplinary climate item wordings see Supplemental Materials; for more details see the PISA Technical report – OECD, 2013).

Disciplinary climate. Following OECD Technical report (2013), the disciplinary climate index used in the present study is defined by students' reports on problems with classroom organization relating to: a) the frequency with which teacher has to wait a long

time for students to be quiet; b) students cannot work well; c) students don't listen to what the teacher says; d) students don't start working for a long time after the lesson begins; and, e) there is noise and disorder in the classroom. Thus, the disciplinary climate scale was measured by five items answered on a four-response scale from "Every lesson", "Some lessons" over "Most lessons", to "Never or hardly ever". The overall reliability was above .80. For including this variable in our model, we ran a multilevel CFA and derived the aggregated factor scores of this scale. For ease of interpretation we recoded this scale making higher values indicate a better disciplinary climate.

Student achievement. Student achievement was assessed with the PISA standardized achievement test in reading (e.g., "forming a broad general understanding of the text"), science (e.g., "describing, explaining, and predicting scientific phenomena"), and math (e.g., "employing mathematical concepts, facts, procedures, and reasoning"). Student achievement in PISA is intended to represent the extent to which 15-year-olds have acquired some of the knowledge and skills that are essential for full participation in society and to make practical use of mathematics in different situations relative to adult life; rather than what is taught in a specific country (OECD, 2013). We included all three subjects tested in PISA 2012 (i.e., science, reading, and math) as indicators for an overall PISA achievement score.

Socio-economic status. When investigating relationships with student achievement it is important to take into account students' socio-economic status (SES) as it might have strong confounding effects (Dicke, Marsh, Parker, et al., 2018). Furthermore, Perie and Baker (1997) reported that teacher job satisfaction is higher in schools with higher SES, making it crucial to control for SES in teacher and principal job satisfaction. Hence, in the present study SES was measured by a school-level item of the TALIS questionnaire that assessed principal's report of the percentage of students from disadvantaged homes attending their school (OECD, 2014).

Statistical Analysis

For all structural equation modeling we used Mplus (Version 8; Muthén & Muthén, 2010). Given the known sensitivity of the chi-square test to sample size to minor deviations from multivariate normality, and to minor misspecifications, applied SEM research focuses on indices that are relatively sample-size independent (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004), such as the Root Mean Square Error of Approximation (RMSEA), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI). Population values of TLI and CFI vary along a 0-to-1 continuum, in which values greater than .90 and .95 typically reflect acceptable and excellent fits to the data respectively. Values smaller than .08 and .06 for the RMSEA support acceptable and good model fits respectively (see e.g., Browne & Cudeck, 1993; Hu & Bentler, 1999; McDonald & Marsh, 1990).

Missing data were handled using the full information maximum likelihood (FIML) approach (Enders, 2010).

All models were analyzed as random intercept multi-level models including two levels: Level 1 (L1) = individual teacher, Level 2 (L2) = school (principal). This modeling approach takes into account the nested (non-independent) structure of the data (teachers nested within schools), thus rendering standard errors that are corrected for this nesting.

We applied latent aggregation in all our models (see Lüdtke, Marsh, Robitzsch, Trautwein, Asparouhov, & Muthén, 2008; Marsh et al., 2009). Moreover, in all our models we estimated all factors with latent variables (except for student level variables which were based on factor scores and plausible values), thereby correcting for measurement error in our measures. Models that simultaneously control for measurement and sampling error can be referred to as doubly latent based on Marsh et al.'s (2009) 2 x 2 taxonomy of multi-level models.

For investigating teachers' and principals' job satisfaction we tested the following

sequence of a-priori derived models[1]:

1. For teachers and principals separately[2]:

   a) Job satisfaction as a two-factor model as suggested by the TALIS manual.

   b) The two-factor model, with the inclusion of correlated residuals of negatively worded items.

   c) A bi-factor model with the two prior factors as specific factors and one general factor, while keeping correlated residuals.

   d) For teachers only: The above model, with the addition of school level aggregated data.

2. In a Combined model we modeled the final bi-factor models for principals and teachers simultaneously. Thus, this model consists of individual level teacher job satisfaction (on L1), aggregated teacher job satisfaction, and principal job satisfaction (both on L2).

3. A multi-group (country) model using the combined model, where we tested for measurement invariance of factor loadings and the variance/covariance structure across countries.

4. A model where we added disciplinary climate and student achievement and tested for invariance over country (based on the eight countries where this was possible). That is, we inducted disciplinary climate (perceived by students) and student achievement as a latent variable measured by standardized tests in math, English, science, and student SES.

Results

Table 1 presents the detailed goodness-of-fit indexes and information criteria of all

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[1] The TALIS job satisfaction scales were developed to consist of two distinct factors. Thus, we use a two-factor model as a starting point. Nevertheless, we provide model fit, which is poor, for the one-factor models in Table S4 in Supplemental Material.

[2] In models 1a-c we took the nested structure of teachers into account by using TYPE = COMPLEX and school as a clustering variable.

models.

Teacher and School Principal Job Satisfaction (H1): A Bi-factor Model?

Teachers. The standard solution by the TALIS manual with two correlated factors (Model 1a), namely satisfaction with the teaching profession and satisfaction with current work environment, provided a fit slightly below acceptable standards (CFI = .93, TLI = .90, RMSEA = .08). The factors correlated with $r = .59$, $p < .001$. Adding correlated residuals for negatively worded items (Model 1b) slightly improved fit (CFI = .95, TLI = .92, RMSEA = .08). Modeling a bi-factor model (Model 1c), where we added a general job satisfaction factor improved model fit (CFI = .99, TLI = .99, RMSEA = .02). Additionally, there was indeed an increase in the R-squared of the manifest items with the average R-square for the two-factor model including residuals ($M = .52$) to the bi-factor model ($M = .56$). Finally, we used a multilevel structure, where parallel bi-factor models were modeled on the individual and school level (Model 1d). This model also provided excellent fit (CFI = .98, TLI = .97, RMSEA = .04).

Principals. Again, the solution with two correlated factors (Model 1e), provided a fit slightly below acceptable standards (CFI = .95, TLI = .93, RMSEA = .09). The factors correlated with $r = .65$, $p < .001$. Correlated residuals for negatively worded items (Model 1f) also slightly improved fit (CFI = .97, TLI = .94, RMSEA = .08), which was, nevertheless, still marginal. As in the teacher sample, modeling a bi-factor model (Model 1g), i.e., adding a general job satisfaction factor, improved model fit (CFI = .99, TLI = .99, RMSEA = .03) and increased the R-squared of the manifest items with the average R-square ($M = .48$ vs. $M = .52$). As these were principals, and there was only one principal per school, no multilevel model was required.

Combined Model of Teacher and Principal Job Satisfaction (H2): Do Matching Factors Correlate Highest?

Using Model 1d as a basis we combined the principal and teacher models. Thus, we added the principal bi-factor model (Model 1g) on the school level. This new combined model (Model 2a, see Figure 1) showed excellent fit to the data (CFI = .99, TLI = .98, RMSEA = .02). While latent factors in this model were orthogonal (uncorrelated) within principals and teachers, latent factors between samples were free to co-vary. Results revealed correlations of moderate to large size between matching factors (all other correlations were small; see Table 2 for all correlations). Thus, teachers' satisfaction with the profession correlated significantly with principals' satisfaction with their profession ($r = .21$, $p < .001$), teachers general job satisfaction correlated significantly with principals' job satisfaction ($r = .35$, $p < .001$), and naturally teachers' and principals' satisfaction with the working environment showed the highest correlation ($r = .77$, $p < .001$). We then tested a model where we constrained the correlations between non-matching factors to be zero. Model fit in this constrained model (Model 2b) changed little (CFI = .99, TLI = .98, RMSEA = .02). Hence, we used the constrained and more parsimonious model for all consecutive models (For factor loadings and variances of this model please see Table S3 in Supplemental Materials).

Invariance over Country (H3): Does the Structure Hold in a Cross-Cultural Comparison?

Next, we tested invariance of these relationships, i.e., variances/covariances over country. The configural model (Model 3a) without any restrictions between groups which served as the baseline comparison model, fit the data well (CFI = .98, TLI = .98, RMSEA = .02). As a prerequisite for testing invariance of factor variances/covariances we first established invariance of factor loadings. The model with invariant factor loadings (Model 3b) fit well and showed little differences to the configural model (ΔCFI = .01, ΔTLI = .01, ΔRMSEA < .015). In a last model, where we constrained variances/covariances to be invariant across all 34 countries, model fit was acceptable and changed little from the preceding model (Model 3c; see Table 1). This suggests there were few differences in the

correlational structure among the 32 countries.

Including Climate and Student Achievement (H4): Is Satisfaction with the Work Environment More Strongly Related to Student Variables than the Other Factors?

In our final model we included disciplinary climate as well as student achievement to Model 2. As in H3 we then tested invariance of the covariance/variance structure over countries (i.e., the eight countries that participated in the TALIS-PISA link). Model fit comparisons provided evidence for invariance of factor loadings and the structure with differences in fit statistics that were just within an acceptable range with regard to cut off criteria (configural vs. variance/covariance structure invariant = ΔCFI = .01, ΔTLI = .01, ΔRMSEA < .015; see Table 1 Model 4a-c for details). The final model showed an excellent fit to the data (CFI = .97, TLI = .97, RMSEA = .02; see Table 1). The job satisfaction factors still correlated with each other as expected from prior models, although the correlation of the satisfaction with the profession variables was reduced ($r = .15$, $p = .088$; see Table 3).

H4a. In line with our hypothesis, disciplinary climate showed the most positive significant relationship with teacher satisfaction with the working environment ($r = .14$, $p = <$ .001) and overall teacher job satisfaction ($r = .12$, $p = .029$) but did not correlate with teachers' satisfaction with the profession. It also did not show any significant relationship to principal satisfaction variables (see Table 3). However, additional analyses using the MODEL CONSTRAINT option in Mplus revealed that only the correlation for teachers' overall job satisfaction was significantly higher for teachers than principals ($p = .019$).

H4b. Student achievement was significantly positively related to teachers' and principals' satisfaction with the working environment ($r = .35$, $p < .001$ and $r = .16$, $p = .048$, respectively; see Table 3). Additional analyses revealed that the correlation for teachers was significantly stronger than for principals ($p = .025$).

H4c. Student achievement was related to disciplinary climate ($r = .33$, $p <.001$; see

Table 3).

After controlling for the school's SES (percentage of students from disadvantaged homes) model fit remained excellent (Model 4d; see Table 1) and the overall pattern of results remained (see Table 3). Most estimates, however, were reduced in size.

Discussion

Results revealed a complex structure of teachers' and principals' job satisfaction, where the best fitting model has two specific factors satisfaction with the profession and satisfaction with the current work environment with an additional overall job satisfaction factor. Further, as expected, matching factors of teachers' and principals' job satisfaction, particularly the satisfaction with the current work environment factors, showed the highest correlations. This structure was invariant over countries. Finally, satisfaction with the current work environment for teachers and principals showed significant relationships with student achievement and disciplinary climate (for teachers only). Controlling for SES reduced these relationships.

Job Satisfaction at School a Complex Construct

Picking up on the yet to be resolved discussion of the conceptualizing job satisfaction as multiple specific facets or by a general factor (Judge et al., 2012; Marsh & Scalas, 2018; Snipes et al., 2005), our approach provides a solution. Indeed, the bi-factor approach we used not only allows specific important aspects of job satisfaction to be taken into account (Meyer et al., 1993), but simultaneously a general factor (Weiss, 2002) can explain additional variance. The model furthermore allows testing differential relationships of the specific factors and the general factor with other variables. This approach is also advantageous for identifying predictors of job satisfaction and consequently evaluating measures based on these predictors aiming to improve job satisfaction. Particularly, separating satisfaction with the profession and the working environment seems important (Meyer et al., 1993) in this regard, as any intervention that improves work aspects might not be able to affect satisfaction with

the overall profession (Skaalvik & Skaalvik, 2011). This is particularly important for

occupations with high attrition rates such as teachers and principals (Darmody & Smyth,

2016; Dicke, Marsh, Riley et al., 2018; Dicke, Stebner et al., 2018). Merely enhancing

satisfaction with either the profession or the working environment might not be effective if it

is the other (or even a completely different) aspect of job satisfaction that is lacking.

Teachers' and Principals' Job Satisfaction are Interrelated and Mutually Reinforcing

To take these aforementioned differential effects of different aspects of job satisfaction

even further, our results showed that it is not just important to identify either teachers' or

principals' job satisfaction, but that these seem highly interrelated. We found strong evidence

for this assumption over 32 countries. The positive relationship of satisfaction with the

profession between principals and teachers might be explained by international research

showing positive effects of principals' transformational leadership styles, which are positively

related to higher principal job satisfaction (Barry, 2002), and teachers' well-being (including

job satisfaction; e.g., Aydin, Sariee, & Uysal, 2013; Collie & Martin, 2017; Littrell,

Billingsley, & Cross, 1994; Orphanos & Orr, 2014). Nevertheless, future studies should look

at such indirect effects in detail for confirming this possible explanation.

The explanation of the high relationship between satisfaction with working

environment is more straightforward, as principals and teachers are both members of the same

organization and thus, similarly affected by the school environment and disciplinary climate

as we discuss in more detail below.

**Teachers' and Principals' Job Satisfaction with the Environment are Positively Related
to Climate and Student Achievement**

A major strength and a novelty of the present study was to be able to include measures

from three different perspectives, i.e., students, teachers, and principals. Furthermore, we

were able to relate teachers' and principals' job satisfaction to student achievement. Focusing

on the disciplinary climate and job satisfaction we found that the disciplinary climate ratings

of students were related to job satisfaction of teachers (with the working environment and overall job satisfaction), in line with research on the effects of disciplinary climate on job satisfaction (e.g., Carr et al., 2003). Maybe the effect of student variables on principals' outcomes is even mediated through teacher variables (Sebastian & Allensworth, 2012), as teachers are usually in more direct and frequent contact with students than principals. Indeed, our research showed that the relationship of teacher variables with student variables was stronger for satisfaction with the working environment and student achievement and for overall job satisfaction and disciplinary climate.

Moreover, disciplinary climate was positively related to student achievement. In line with our predictions based on prior research (e.g., Currall et al., 2005), some of which was even based on the same sample (Sealy et al., 20016, we found teachers' and principals' satisfaction with the environment to be positively related to student achievement. After including SES as a covariate, thus controlling for differences in the schools' composition and resources, those relationships decreased. This is important as it shows that the effect of teacher (and principal) variables on students' achievement without any controls are most likely too high and are confounded with SES (Dicke, Marsh, Parker et al., 2018). Indeed, Darmody and Smith (2016) found principals' job satisfaction to be higher in private (high SES) schools.

Limitations and Future Research

The research presented here had several strengths. We used large-scale multinational data of 32 countries which were analyzed with complex multilevel bi-factor models for taking the clustered structure into account. This enabled us to consider multiple perspectives of school variables and their interrelations. In fact, this study is the first to our knowledge which has integrated principal, teacher, and student variables using the TALIS-PISA link.

However, the study has some limitations that need to be addressed. As is often the case with multi-national large-scale studies the data used here was cross-sectional. Thus, it

was not possible to model longitudinal predictions between our variables of interest. Furthermore, student data was collected in the PISA 2012 wave, while teacher and principal data was collected in the TALIS 2013 wave. Thus, although unlikely, because we linked based on school level teachers and principals might have not been at the same school as the student at the time of the PISA assessment (see Austin et al., 2015). Nevertheless, as numerous meta analyses indicate achievement contexts at this age are very stable (e.g., Huang, 2011; Schneider & Preckl, 2017). Thus, the achievement measure in 2012 is a good proxy for achievement in 2013. Furthermore, we ran additional analyses including only those teachers and principals that have worked at the same school for at least two consecutive years, which ensures that teachers and principals worked at the school at the time of the PISA collection. Results are very similar and the pattern did not change. However, this is a very conservative approach to tackle the issue (see Table S5 in Supplemental Materials).

Unfortunately, as it was only possible to link at the school level, the opportunity for modeling a more accurate model where students are nested in teachers (classes) and these are in turn nested in principals (schools) was missed. Future research should establish such databases making even more detailed hypothesis and cross-level modeling possible. Moreover, the TALIS-PISA linkage was only available for eight countries.

Finally, the climate variable used in the present research focused on disciplinary climate (see Supplemental Materials for details). It is important to include more general measures of school climate and assessment of agreement for students, teachers, and principals. Overall, there are many other possible research questions that could be tested within the realm of school well-being using the linked dataset and other important variables, such as aspects of how leadership affects teacher behavior and student motivation and achievement.

Implications

Overall, our research emphasized the importance of looking at differential aspects of job

satisfaction (Judge et al., 2017), and shows the significant association job satisfaction, particularly with the working environment, has with student outcomes. This pattern of relationships was consistent over different cultural contexts and countries and thus, results have broad relevance for the measurement of job satisfaction in general and systems of education worldwide.

With regard to measurement our research highlights the importance of being clear on the theory underlying the measure. Thus, researchers need to be aware that job satisfaction is multidimensional and thus, the items and facets used to measure job satisfaction always depend on the exact research question; i.e., are they interested with satisfaction with the profession or even more specifically with the satisfaction with the income etc. Further, the different facets or dimensions operate independently, meaning that satisfaction in one area might affect outcomes that another does not affect. Related to this, if a general measure of job satisfaction is used it is advisable to model specific facets in addition to a general factor to detangle possible conflicting influences. For example, one could be highly satisfied with the profession, but not the work environment leading to a non-significant effect with an outcome as these facets will cancel each other out.

Furthermore, the present study provided strong evidence for a strong link between job satisfaction in the working environment and disciplinary climate and student achievement, particularly for teachers irrespective of the country. Thus, all three school levels are interrelated, which demonstrates the importance of targeting educational interventions and policies world-wide, not only at a single school level (e.g., teachers), but with the understanding that these levels interact and that changes will affect the whole school system. These findings promote the necessity to apply a holistic model, including students, teachers, principals, and other significant perspectives within the school environment. Moving our research forward should include information on parents, administrators, and other staff.

Results however, where somewhat confounded by students' SES, showing the

importance of taking student background characteristics into account when investigating

achievement.

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Table 1

Model Fit for all Models

Group	Model	χ^2	df	RMSEA	CFI	TLI
Teachers	1.a) CFA	18319	19	.08	.93	.90
	1.b) CFA-CU	12534	16	.08	.95	.92
	1.c) Bi-CFA-CU	652	9	.02	.99	.99
	1.d) Bi-CFA-CU (MLM)	5742	34	.04	.98	.97
Principals	1. e) CFA	834	13	.09	.95	.93
	1. f) CFA-CU	602	12	.08	.97	.94
	1. g) Bi-CFA-CU	40	6	.03	.99	.99
Combined	2. a) Bi-CFA-CU (MLM)	4022	71	.02	.99	.98
	2 b) Bi-CFA-CU (MLM)-matching	4060	77	.02	.99	.98
Multi-group	3. a) Bi-CFA-CU (MLM)-config	6641	2464	.02	.99	.98
	3. b) Bi-CFA-CU (MLM)-FL	11709	2898	.03	.96	.97
	3. c) Bi-CFA-CU (MLM)- FL -CV/v	12331	3084	.03	.97	.97
Including Student Variables	4. a) Bi-CFA-CU (MLM)-config noSES	2082	1050	.02	.98	.98
	4. b) Bi-CFA-CU (MLM)- FL-noSES	3460	1205	.02	.97	.96
	4. c) Bi-CFA-CU (MLM)- FL -CV/v noSES	3576	1293	.02	.97	.97
	4. d) Bi-CFA-CU (MLM)- FL -CV/v SES	3771	1429	.02	.97	.96

Note. CFA = Confirmatory Factor Analysis, CU = Correlated Uniquenesses, Bi- = Bi-factor model, MLM = Multilevel Model, matching = correlations only allowed for matching factors, config = Configural model, FL = Factor Loadings invariant, CV/V = Covariance/Variance matrix invariant, noSES = not controlling for SES, SES = controlling for SES.

Table 2

Correlations between Teacher and Principal Matching and Non-Matching Job Satisfaction Factors

	Teacher Satisfaction with the Profession	Teacher Satisfaction with the Working Environment	Teacher General Job Satisfaction
Principal Satisfaction with the Profession	**.21(.03)**	**-.09(.03)**	**.06(.02)**
Principal Satisfaction with the Working Environment	-.03(.07)	**.77(.10)**	-.07(.07)
Principal General Job Satisfaction	.02(.02)	-.03(.03)	**.35(.02)**

Note. Results significant with an alpha level <.05 in bold. Standard errors in parenthesis; Matching correlations are shaded in grey.

Table 3

Correlations in the SEM model all Teacher and Principal Job Satisfaction Factors with different measures of School Climate and Student Achievement before and after controlling for SES.

		1.	2.	3.	4.	5.	6.	7.	8.
1.	Teacher Satisfaction with the Profession	-							
2.	Teacher Satisfaction with the Working Environment	0	-						
3.	Teacher Overall Job Satisfaction	0	0	-					
4.	Principal Satisfaction with the Profession	.15(.09)/ .13(.09)	0	0	-				
5.	Principal Satisfaction with the Working Environment	0	**.42(.07)/ .44(.07)**	0	0	-			
6.	Principal Overall Job Satisfaction	0	0	**.15(.06)/ .16(.06)**	0	0	-		
7.	Student Achievement	.08(.07)/ .04(.07)	**.36(.04)/ .30(.05)**	.07(.06)/ .08(.06)	.09(.05)/ .07(.05)	**.16(.08)/ .18(.08)**	-.02(.05)/ -.01(.05)	-	
8.	Disciplinary Climate perceived by Students	.03(.06)/ .01(.06)	**.14(.04)/ .10(.05)**	**.12(.06)/ .12(.06)**	.01(.05)/ .0(.05)	.05(.08)/ .05(.08)	-.05(.05)/ -.05(.05)	**.33(.05)/ .30(.03)**	-
9.	Student SES[a]	**-.16(.07)**	**-.30(.05)**	-.04(.07)	**-.07(.06)**	-.00(.10)	.02(.06)	**-.43(.04)**	**-.19(.03)**

Note. Correlation Coefficients without controlling for SES/ Correlation Coefficients after controlling for SES. Results significant with an alpha level <.05 in bold. Standard errors in parenthesis. a = the results reported for SES are standardized regression coefficients.
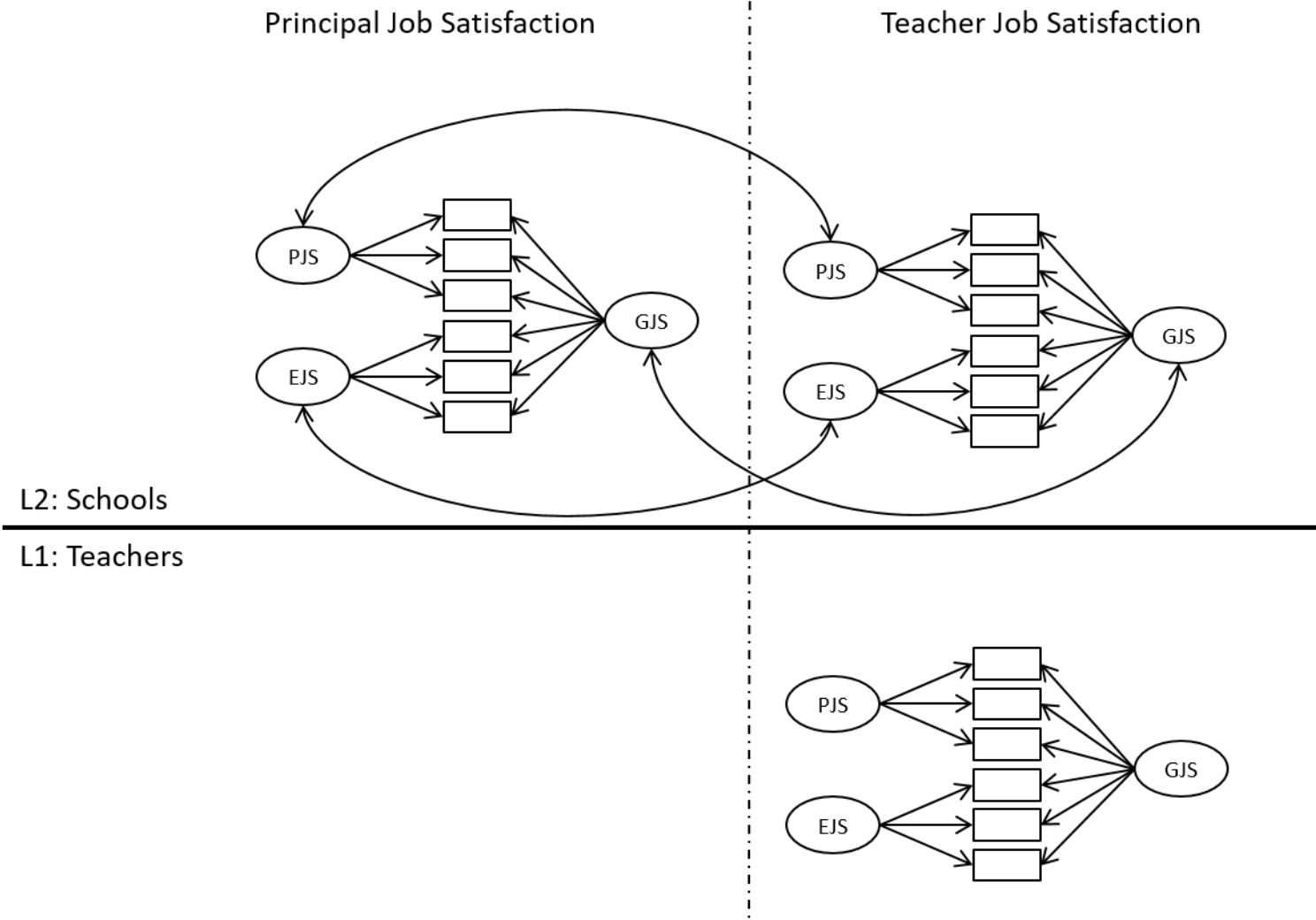
Figure 1. A conceptual multilevel bi-factor model of teachers' and principals' job satisfaction. PJS = Satisfaction with the profession, EJS = Satisfaction with the current work environment, GJS = general job satisfaction, L1 = Individual teacher level, L2 = School or principal level. Correlations are only displayed for matching job satisfaction factors