

A systematic literature review of TALIS secondary research: Trends and future directions

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Abstract

The Teaching and Learning International Survey (TALIS) collects data from representative samples of teachers and principals across the world about their practices and work conditions, school and classroom contexts, and attitudes, motivation, and satisfaction with their profession and jobs. Given the growth of participating countries, the number of constructs assessed, and the volume of publications based on secondary analyses of the freely available data, it is reasonable to claim that TALIS represents one of the major data sources in the field of international educational research. This study provides a systematic literature review of secondary analyses of TALIS data, summarising the past 15 years of TALIS research. The review includes a synthesis of 238 peer-reviewed journal articles, providing bibliographical information about articles as well as the scope and impact of analysis of TALIS data across time, countries, and populations. Moreover, the article summarises information about the most prevalent research themes that have been investigated. The findings highlight the importance of TALIS data in the broader educational research scope, emphasising themes such as teacher characteristics, and teacher professional practices. Lastly, the review provides insights into methodological approaches to study and analyse TALIS data and calls for more caution in analysing complex survey data with respect to how clustering and multigroup design are handled.

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KEYWORDS

international large-scale assessments (ILSA), systematic literature review, Teaching and Learning International Survey (TALIS)

Context and implications**Rationale for this study**

The main purpose of this review is to evaluate the use of TALIS data, providing an overview of the frequency and nature of its use, themes addressed, and methodologies applied in secondary analysis.

Why the new findings matter

The findings from this review provide a foundation for future research using TALIS data and can further inform and guide developments for upcoming TALIS cycles.

Implications for researchers and policymakers

Researchers are advised to study underexplored themes, validate findings across diverse educational contexts, and approach with care when analysing complex survey data. Given the imbalance in research themes and contexts studied, policymakers are advised to be cautious when using TALIS-based research to inform educational policy. For those involved in the development and implementation of TALIS, the review findings can be of relevance for future study frameworks and instruments.

INTRODUCTION

The Teaching and Learning International Survey (TALIS) is one of the most prominent studies alongside the Programme for International Student Assessment (PISA) conducted by the Organization for Economic Co-operation and Development (OECD). TALIS monitors trends in the quality of teaching by collecting data from representative samples of teachers and principals across a large number of countries every 5 years. The teachers and principals participating in TALIS provide extensive reports about their practices and work conditions, school and classroom contexts, and attitudes, motivation, and satisfaction with their profession and jobs. According to the TALIS conceptual framework, five general policy areas are covered by the survey: (1) school policies supporting effectiveness, (2) developing teachers within their professions, (3) effective teachers and teaching, (4) attracting teachers to the profession, and (5) retaining teachers in the profession (Ainley & Carstens, 2018).

The popularity and significance of the TALIS study is clear from the study's expansion in several different aspects, of which the increase in the number of participating countries and territories is one of the most apparent aspects. The first round of TALIS in 2008 involved 23 countries and 2 territories in the main core survey, which focused on teachers and principals from lower secondary schools (ISCED¹ level 2). In comparison, the subsequent cycle in 2013 had an increase in the number of participating countries, encompassing over 30 countries and 6 territories in the main survey. The latest TALIS cycle in 2018 was the most

comprehensive to date, with as many as 41 countries and 8 territories, rounding the number of participating jurisdictions to 49. Furthermore, the core survey in the forthcoming TALIS 2024 is announced to have 54 participating jurisdictions (OECD, 2023).

Another observable trend as an indicator of the study's growth is the increase in the optional modules that are offered to countries in addition to the main survey. Optional modules refer to additional populations that can be surveyed alongside the core population. Whereas TALIS 2008 only had questionnaires administered to teachers and principals in lower secondary schools, TALIS 2013 included the main survey and three optional modules. Thus, participating countries and territories in TALIS 2013 had the opportunity to survey teachers and principals in primary schools (ISCED level 1), upper secondary schools (ISCED level 3), and teacher and principals from schools who participated in PISA, known as the PISA-TALIS link module (OECD, 2023). In addition to the modules that were offered in TALIS 2013, TALIS 2018 introduced the TALIS Starting Strong Survey module. The forthcoming TALIS 2024 announced yet another module—the Teacher Knowledge Survey (TKS). The TALIS Starting Strong Survey seeks to identify challenges and opportunities for early childhood education whereas the TKS option aims to assess the strengths and weaknesses of teachers' pedagogical knowledge base (OECD, 2023).

The quantity and breadth of the examined constructs is another evident indicator of the study's growth. For instance, in TALIS 2008 teachers responded to approximately 180 items divided into six broader themes: background information, professional development, teacher appraisal and feedback, teaching practices, beliefs and attitudes, and teaching in the particular class; whereas TALIS 2018 featured a larger questionnaire that encompassed over 200 items, including new themes such as teaching in diverse environments and teacher mobility.

As the scope of TALIS continues to grow, secondary research using TALIS data is also expected to grow in volume and coverage. However, this claim can currently not be supported with evidence similar to the systematic review by Hopfenbeck et al. (2018) on the impact of PISA data on educational research or the study by Lenkeit et al. (2015) describing how the Progress in International Reading Literacy Study (PIRLS) is represented in scientific journals. Accordingly, this paper seeks to present a similar systematic review of TALIS. Such literature reviews can provide insights into the frequency, nature and content of the articles that use TALIS data, but also insights about the methodologies that are used for secondary data analysis. This kind of information about TALIS research is crucial to identify major research streams and future research directions within the field, but also to provide an opportunity to compare the growth and significance of TALIS with other large-scale educational studies. Moreover, such scoping reviews represent a vital source for the continued improvement and understanding of the studies themselves.

Unlike systematic reviews that seek to synthesise the empirical evidence on the specific relationship among constructs (see, for example, Teig et al., 2022), or meta-analysis approach that seeks to synthesise effect sizes (see, for example, Scherer & Siddiq, 2019), the bibliometric approaches to systematic reviews seek to describe the amount of research in a particular discipline identifying prominent researchers, journals or topics in the particular publication period (Hernández-Torrano & Courtney, 2021; Linnenluecke et al., 2020). For instance, Hernández-Torrano and Courtney (2021) used a bibliometric approach to synthesise research using international large-scale assessment (ILSA) data, including PISA and other studies such as PIRLS, the Trends in International Mathematics and Science Study (TIMSS), the International Civic and Citizenship Education Study (ICCS), and the International Computer and Information Literacy Study (ICILS).

This study complements the existing research summaries by conducting a comprehensive bibliographical synthesis of peer-reviewed journal articles that employed TALIS data for secondary analysis. Furthermore, the study includes an analysis of the specific research topics that were investigated using TALIS data, as well as those that until now have been

ignored or neglected despite the availability of relevant data. Additionally, we present an overview of the methodological practices and approaches that are commonly used to analyse TALIS data. By doing this, we aim to provide essential knowledge about the utility of TALIS data for the broader research community, while also providing information of relevance for further development of the TALIS study itself.

A conceptual mapping of themes in TALIS

To inform participating countries about how they can develop and improve their policies regarding teachers and teaching, TALIS strives to provide robust international indicators by focusing on policy-relevant issues and comparability across countries (Ainley & Carstens, 2018). In this paper, we focus our investigation and discussion with reference to the TALIS 2018 conceptual framework and conceptual mapping of themes. The main elements of the frameworks from the earlier TALIS studies are also adequately covered in the 2018 framework, thus the 2018 framework represents a unifying conceptual lens for the mapping of the research literature. Whereas TALIS 2013 was based on a conceptual model with the core terms inputs, processes and outcomes at different levels of educational actors, TALIS 2018 reorganised the overarching conceptual landscape into two dimensions: focus and level. The *focus* dimension refers to the extent to which the theme is concerned with professional characteristics or practices, whereas the *level* dimension indicates whether the themes refer to the institution level (i.e., school/principal, national system) or to teachers.

Table 1 shows an adapted version of the original conceptual matrix. This version has kept the original dimensions (*focus* and *level*) and their respective division into two sub-categories. This creates a matrix with four cells, and these cells have been given overarching labels, including principal/school characteristics, principal/school practices, teacher characteristics, and teacher practices, representing what we refer to as *themes*. However, to better capture the themes in the reviewed literature, we have included more small-grained specification. In Table 1 these are the bullet-points within each of the cells, and we refer to

TABLE 1 Conceptual mapping of themes in TALIS 2018 (adapted from the TALIS conceptual framework, p. 19, Ainley & Carstens, 2018).

Focus		Professional characteristics	Professional practices
		Level	Institutional
	Teacher	<ul style="list-style-type: none"> • <i>Teachers' and classroom demographics</i> • Teachers' education and initial preparation • Teachers' job satisfaction and motivation • Teachers' workload stress • Teachers' feedback and development • Teachers' self-efficacy • Pedagogical beliefs 	<ul style="list-style-type: none"> • Teachers' professional practices • Teachers' pedagogical practices and beliefs

each of these as *topics*. These specific topics were originally part of the TALIS conceptual framework but some of them were organised differently. In particular, we found it more logical to include the large number of measures and variables describing principals' background as a core feature of school/principal characteristics. Originally these characteristics were included in the TALIS framework as part of the school leadership. However, characteristics such as principals' age or experience are not indicators of practices. Accordingly, and consistent with how teacher concepts are organised in the framework, we have for this review established Principal/School characteristic as one of the main themes to map the literature. This theme includes studies focusing on principals' demographics, qualifications, recruitment, development, workload and satisfaction but also studies that relate to human resource issues and stakeholders' involvement. Moreover, the background information for schools, principals and teachers were discussed as a separate section in the original TALIS framework. We have now placed them in the respective overarching themes, including school and principal demographics as separate topics in the upper left quadrant, and teachers' demographics in the lower left quadrant. Therefore, our modifications to the original framework are presented in italics in [Table 1](#). By doing this we intend to establish a clear distinction between professional characteristics and professional practices as well as to provide a comprehensive overview of all specific topics studied in TALIS. Even this more fine-grained level of specification of the conceptual framework turned out not to be completely exhaustive of the themes/topics covered in the reviewed literature. Accordingly, we also had to include a category (*other*) for miscellaneous topics not captured in [Table 1](#). More details about the topics will be returned to in the following sections.

By categorising and representing how journal articles are distributed across this conceptual matrix, our systematic review informs about the extent to which, and how, the themes included in the TALIS framework are represented in secondary research using TALIS data. This approach will help to identify topics that have received a lot of attention and, perhaps more important, the approach also allows us to highlight themes that have received relatively little attention from the broader research community.

Methodological issues of specific relevance for analysing TALIS data

The latest TALIS cycle surveyed several target populations including teachers and principals in lower secondary schools, primary schools, upper secondary schools, and schools participating in PISA. Due to the unrealistic and impractical nature of assessing the entire population (e.g., all teachers and principals in lower secondary schools within the country), TALIS like other ILSA uses complex sampling designs to ensure a representative sample of the entire population of interest. The complex sample design in ILSA is characterised by three elements: stratification, hierarchical cluster structure, and unequal selection probabilities of sampling units. As discussed by Meinck and Vandenplas (2021), such complex samples, although practical, introduce sampling error that must be properly estimated and subsequently applied in inferences of results from analyses of ILSA data. This is achieved by applying correct sampling weights to account for unequal selection probabilities and non-response and by using multilevel hierarchical modelling or replication methods to account for the hierarchical structure of the data (e.g., teachers nested in schools, schools nested in countries) (Jakubowski & Gajderowicz, 2022). Stratification in the sample design, which also impacts standard errors, can only be accounted for when using replicate weights. Thus, the recommended TALIS approach to fully account for complex sample design is the usage of replicate and sampling weights in combination. However, analyses that include latent variable modelling, such as factor analysis or structural equation modelling, may be estimated without replicate weights, in which cases multilevel modelling is the

suggested method. Although there are differences between the two approaches (replicate weights and multilevel modelling), the practical implementation may result in smaller or larger differences in standard error estimates based on the sample. Nevertheless, these differences should not be of substantial concern, as demonstrated by Jakubowski and Gajderowicz (2022).

Many secondary analyses of ILSA data involve comparisons across groups to investigate whether certain relationships of interest vary across countries or across populations within studies. Moreover, it may be of interest to compare levels or 'amount' of specific characteristics across participating countries. To address such research questions, researchers must ensure invariance of measurement and structural models (Leitgöb et al., 2023). It is worth mentioning that TALIS was the first international large-scale study in education that reported levels of measurement invariance for latent constructs in the final data release. Invariance of measurement and structural models is frequently tested and achieved through different approaches such as multigroup confirmatory factor analysis, multigroup structural equation modelling, alignment method or the Bayesian approach (Desa et al., 2018; He et al., 2022; Leitgöb et al., 2023). No valid comparisons can be made without first ensuring invariant measures, making this step a crucial part of studies that aim to compare results across multiple groups.

Yet another challenge of working with ILSA is the large amount of missing data (Grund et al., 2020). Missing data can occur either by design (e.g., when rotated matrix questionnaire design is used to administer tests) or for some random reason (e.g., when certain questions are skipped, missed or not reached). It is crucial to report the degree of missing data and the steps taken to handle this issue when analysing the data. Some simple approaches to deal with missing data include various forms of deletion (e.g., listwise, pairwise), imputation (e.g., regression, mean), or solutions that include a full information maximum likelihood (FIML) procedure (Pigott, 2001).

The approaches to analyse data from ILSA, including analysis of TALIS data, are influenced but not limited to the above-mentioned factors. Accordingly, this review seeks to inform about the approaches that are used in secondary data analysis of TALIS with respect to multistage complex survey design, measurement invariance and handling of missing data.

THE PRESENT STUDY

The present study synthesises peer-reviewed journal articles that utilised TALIS data, including also studies using additional data sources. The aim of the study is to inform about the bibliographical characteristics of the articles, including prevalence over broader disciplines, years, authors and journals. Moreover, the study aims to inform about thematic coverage using an adapted version of the TALIS 2018 conceptual framework as the reference point. Lastly, the study informs about research approaches that are used to analyse TALIS data with respect to the complex sampling, measurement invariance, and handling missing data. Accordingly, the study aims to address the following research questions:

1. What are the bibliographical characteristics of the articles that use TALIS data for secondary analysis?
2. What are the characteristics of the data and samples utilised in secondary analyses of TALIS data?
3. Which methodological approaches are applied in secondary analyses of TALIS data?
4. What are the most prevalent topics investigated in secondary analyses of TALIS data?
5. What are the most neglected topics in secondary analyses of TALIS data?

RESEARCH METHODS

Literature search

The electronic systematic search was conducted in six scientific databases that cover research literature in the social sciences: Web of Science, Scopus, ERIC, APA PsycNet, ScienceDirect and ProQuest. The search was conducted using the keywords “TALIS” and “Teaching and Learning International Survey” in all fields (title, abstract, full text) within the range of 14 years (January 2008–June 2022). The starting date matches the first round of TALIS, while the end data matches the day when the initial search was conducted (June 2022). Two additional searches were conducted to update the results and include new studies published in the period between June 2022 and March 2023, as well as those from March 2023 to December 2023, respectively. The database search was restricted to only peer-reviewed journal articles and articles published in English.

Inclusion/exclusion criteria

All articles identified in the searches were first evaluated for inclusion or exclusion according to the criteria displayed in [Table 2](#).

Search and screening process

We used the EPPI Reviewer software (version 4.12.6.0) for deduplication and screening of the publication records (Thomas et al., 2023). As shown in [Figure 1](#), a total of 1039 articles were identified through the initial search in the six scientific databases. After removing duplicates ($n=350$), a total of 689 articles were screened by reading titles and abstracts and applying the inclusion/exclusion criteria. This was done by a single reviewer. In this phase, most of the articles were excluded because the data used were not from the TALIS study. Rather, TALIS was only mentioned as a reference, for descriptive purposes or the TALIS acronym referred to something else. If we were uncertain about the inclusion/exclusion of the article just based on the title and abstract, the article was included for the full text screen. After screening titles and abstracts, a total of 276 articles were eligible for full text screening. In this phase, two researchers independently screened all the articles with over 95% agreement. In cases where the researchers did not agree they met to discuss a final joint decision. After this screening stage, 164 articles were included. The most common reasons for exclusion in this stage were either that a closer read revealed that the article did not conduct a secondary analysis of TALIS data, the article was an OECD report, working

TABLE 2 Inclusion/exclusion criteria.

Inclusion criteria	Exclusion criteria
Articles that present secondary data analysis of TALIS	Tutorials, reviews, conceptual and methodological articles that used TALIS data for demonstration purposes
Articles published in peer-review journals	Working papers, OECD reports, doctoral dissertations and other grey literature
Articles published in English	Articles published in languages other than English
Articles with full text available through various channels	Articles without full text access

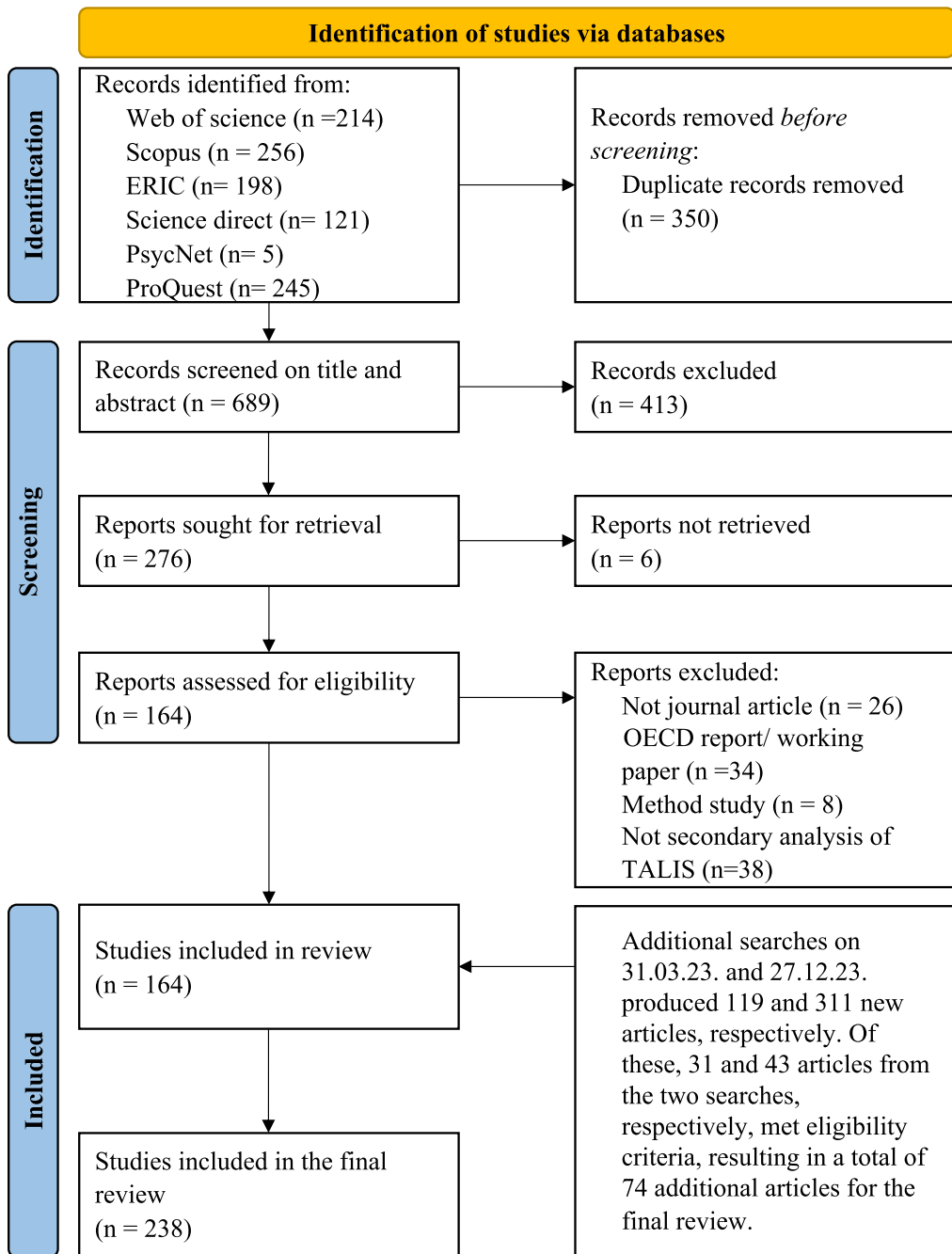


FIGURE 1 PRISMA flow diagram of the search, screening and inclusion processes.

paper, or book chapter, or the TALIS data were used only for demonstration purposes in a more method-oriented article. To update the database, two additional searches were conducted on 31 March 2023 and 27 December 2023. Following the same screening procedures, these searches resulted in the addition of 31 and 43 new articles, respectively. Consequently, the final review included a total of 238 articles (the full list of articles is available in Appendix S1).

Coding procedure and data extraction

The 238 articles that were eligible to be included in the final review were extracted and coded in the EPPI Reviewer against a developed codebook. The codebook (available in Appendix S2) consisted of numerous variables divided into four overarching categories:

1. *Article information* provides bibliographical information such as author(s), year of publication, journal and journal discipline. Many of these, excluding journal discipline, were automatically extracted from the EPPI Reviewer, and were not manually coded.
2. *Data and sample* category includes details regarding the characteristics of the specific TALIS sample that was analysed in the paper, such as the number of selected countries or the specific target population.
3. *Method and study design* includes details regarding the variables that are used in the analyses, but also details regarding the methodological choices relevant for the analysis of TALIS data, such as the usage of weights or handling of hierarchical data structure.
4. *Research themes and topics*. The thematic focus of the journal articles was organised into four themes, and each of these themes are further specified into several topics (see Table 1). In addition, a number of articles did not fit into any of these themes, and these are collected in a fifth theme labelled *other*.

During the coding process it was possible to assign multiple overarching themes to a single article. This flexibility allowed to code articles that cross-reference multiple overarching themes. For instance, an article that investigated the association between school leadership and teachers' self-efficacy would cover two overarching themes: school/principal practices (topic school leadership), and teacher characteristics (topic self-efficacy). Therefore, the total number of articles across the themes does not necessarily add up to the total number of articles included in the review. Furthermore, when coding the themes, only the primary focus of the article was considered. This means that if a correlational study included control variables in a regression model (e.g., teacher age, teacher experience), these controls were not coded. In contrast, if a study specifically aimed to explore and analyse variables such as teacher age or teacher experience, this article was coded as belonging to the theme teacher characteristics, in addition to codes for the more specific topics.

After the coding and data extraction, the data were exported to Excel and RStudio (R Core Team, 2021) and further managed and analysed.

Reliability checks

Several measures were taken to ensure the reliability of the coding. The authors of the study developed the codebook, which was improved and updated through several iterations. After the initial codebook was developed, the three authors independently coded four randomly selected articles to identify any ambiguities or missing elements in the codebook. Next, four reviewers independently coded 10 randomly selected articles to check the inter-coder reliability.² Partial agreements were counted as disagreements. On average, across articles and codes, the four reviewers agreed in more than 90% of the cases. Some codes proved to be less clear, but disagreements were easily resolved during the joint discussion and analysis of the coding scheme. Based on the experiences from this reliability coding, the scheme was updated again with a few minor changes. Finally, the four reviewers were randomly assigned articles for the main coding. Moreover, for practical reasons, the distribution of articles across the four reviewers was not equal, with two of the reviewers coding most of the articles.

Limitations

This systematic review comes with some limitations. First, we did not consider the quality of the methodological design of the studies that were included in the review by, for example, restricting the search to the journals with specific impact factors. Instead, we included all articles that were returned by the search providing a credible and representative picture of all secondary peer-reviewed research with TALIS data. While we acknowledge that this approach resulted in the inclusion of papers of varying quality, it was essential in order to comprehensively capture the diversity of research available. Moreover, the search was restricted to publications written in English due to the scope of the project. Incorporating articles from non-English journals would likely give a more comprehensive and balanced picture of how various geographical regions are represented in the literature and this should therefore be encouraged in future research.

RESULTS

The results of the systematic review are presented following the main research questions, which are also in line with the four main categories from the coding scheme, including article information, data and sample, method and study design, and themes. The thematic coverage category is further organised around the four overarching themes matching the TALIS conceptual mapping of themes (see [Table 1](#)).

Article information

This study synthesised and analysed a total of 238 articles. The initial TALIS survey was conducted in 2008, with data only being available in June 2009. Consequently, the first article using secondary analysis of the TALIS data was not published until 2010. Over time, the number of published articles has gradually increased, with smaller peaks observed in 2013 and 2016. A significant increase in the number of published articles was observed in 2020, and this trend continued, reaching the highest point with 59 publications in 2023. [Figure 2](#) shows a decline to 36 articles in 2022, followed by a significant increase in 2023. However, we can say that there is an overall growth in the number of published articles that points to the increased significance and popularity of the study in recent years. This is in line with trends that are found and maintained with data from other ILSA (Hernández-Torrano & Courtney, 2021) with TALIS having a gradual rise and somewhat slower pace in gaining recognition and popularity in secondary research compared to PISA (Hopfenbeck et al., 2018). An overall rise in publications follows the release of each cycle results, which usually picks up 2 years after the study has been administered. This probably reflects the period of actual data availability and data processing, as well as the time taken to conduct and publish research. Similar to the findings of Hopfenbeck et al. (2018) with PISA data, we find that the latest cycle of TALIS is the most frequently used.

The articles that used TALIS data for secondary analysis were published in a total of 139 peer-reviewed journals. Most of these journals are from the broader educational discipline ($n=184$), with a smaller number from multidisciplinary ($n=29$) and psychology-focused ($n=14$) journals (see [Figure 3](#)). On the contrary, journals within the disciplines of sociology and management have published only a few studies using TALIS data ($n=2$). A small number of articles ($n=9$) were categorised as 'other'. The top five journals that publish TALIS research include *Teaching and Teacher Education* that stands out as the publication channel with the highest number of articles ($n=17$), followed by *Frontiers in Psychology* ($n=8$), and the *International Journal of Educational research* ($n=7$), *School Effectiveness and School*

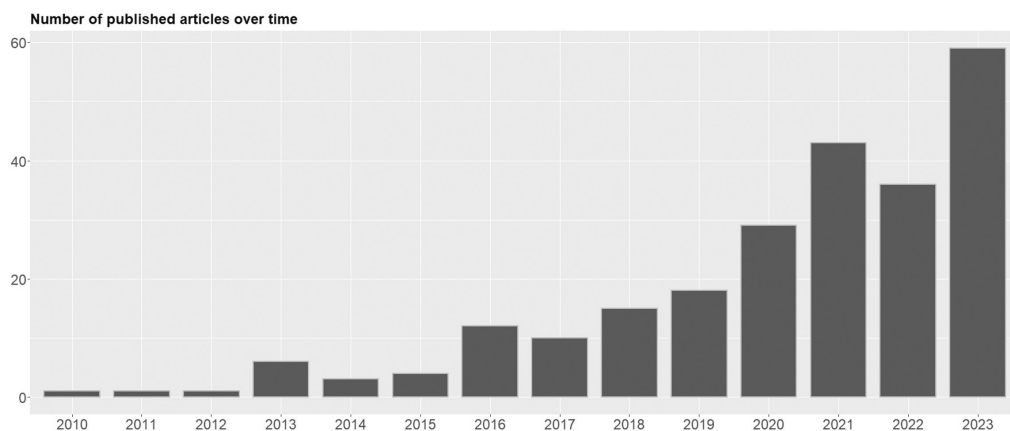


FIGURE 2 TALIS across time.

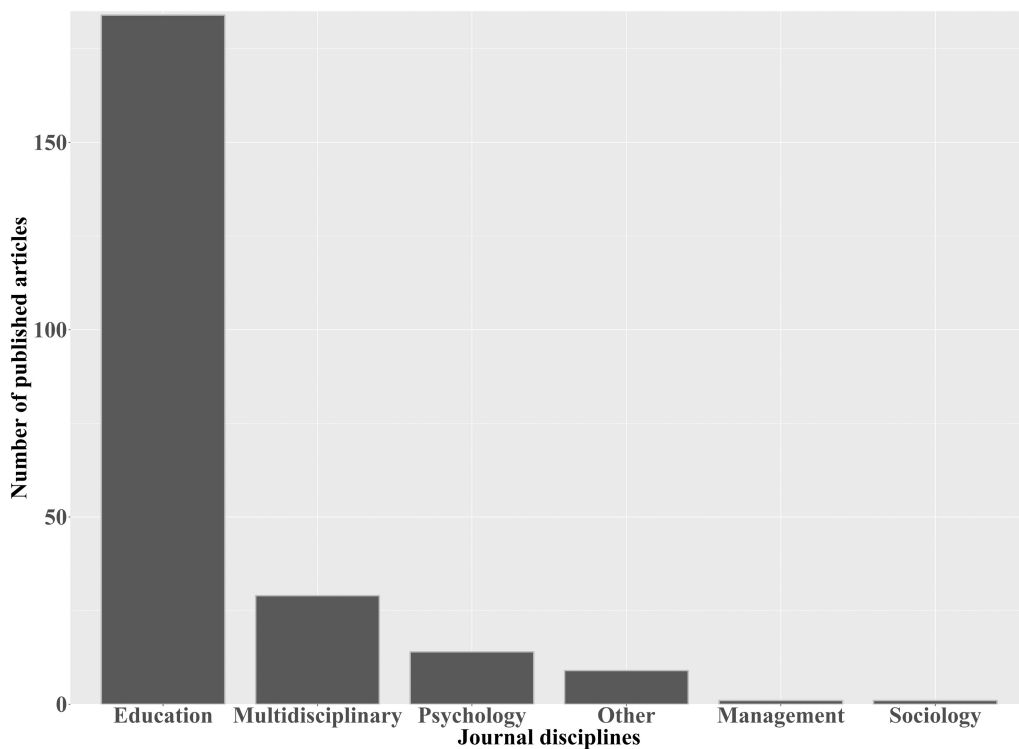


FIGURE 3 TALIS across journal disciplines.

Improvement Journal ($n=6$), and the *Asia Pacific Journal of Education* ($n=5$). Similar to the PISA journal profile presented by Hopfenbeck et al. (2018), TALIS research is primarily disseminated within the broader educational discipline. However, in contrast to PISA, the broader disciplines of Economics and Science Research, which are the second most covered in PISA, do not seem to carry any level of significance in the context of TALIS.

Most of the articles ($n=193$) had several authors. Yan Liu from Michigan State University was the leading first author with a total of 12 journal articles (of which 8 as a first author). Other researchers who frequently published secondary analyses of TALIS data are Mehmet

Sukru Bellibas ($n = 14$ of which 5 as the first author) from Adiyaman University in Turkey, and Gumus Sedat ($n = 11$) from the Education University of Hong Kong. These three identified authors also frequently published together. Beyond this easily observable pattern, we have not done a detailed bibliographical network analysis.

Data and sample

Data from the last two cycles of TALIS were most frequently analysed (see [Figure 4](#)). Only two articles used data from more than one cycle of TALIS in the same study, combining the TALIS 2008 and 2013 datasets (Wermke & Prøitz, 2019), and the TALIS 2013 and 2018 datasets (Liu & Du, 2022), respectively. The increased number of articles over the included years reflects that data from the most recent cycles of TALIS are used more. However, data from prior cycles are still being used, extending beyond their respective release years. For instance, we find that in 2020 and 2021, both TALIS 2013 and 2018 data were almost equally represented. Nevertheless, after 2022, researchers predominantly favoured the use of the latest TALIS 2018 data. We also observe that the TALIS 2008 data has not been used after 2019.

In most cases, TALIS data were used as the only source of information in the articles ($n = 191$). If combined with other data, it is most frequently with PISA ($n = 17$), which was enabled by the PISA-TALIS link module. Such articles mostly examined student achievement as the outcome variable in relation to other teacher and school characteristics measured in TALIS. There are also cases when TALIS data are combined with other sources ($n = 30$) to capture country-level variables. Examples of such sources or variables are UN data, World Value Survey data, country Gini index and/or GDP measures.

Regarding TALIS populations, the TALIS main survey (i.e., lower secondary) was most frequently used alone ($n = 190$) or in combination with other optional modules ($n = 12$), while data from the primary and upper secondary modules were rarely individually investigated ($n = 6$ in total). Data from the TALIS PISA link is the most used among all the other optional populations ($n = 12$). We have also recorded 18 articles that did not explicitly state which level data are coming from, but in most cases, we could indirectly infer that they used data from the main lower-secondary population.

In terms of the distribution of articles that included data from either a single country or multiple countries, it is observed that TALIS data are predominantly analysed in studies encompassing more than one country ($n = 140$). Among these, the full sample of participating

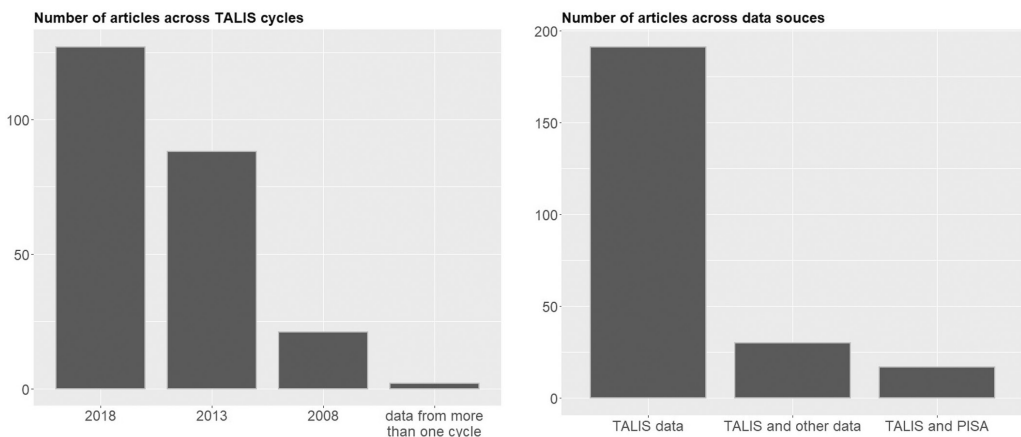


FIGURE 4 TALIS across cycles (left-hand panel) and data sources (right-hand panel).

countries was the most common ($n=61$). Other articles included more specific samples by selecting a smaller set of countries from the same geographic region ($n=18$) such as Nordic, Baltic or European countries. Further, certain analyses included contrasting countries ($n=19$), such as those from East and West or high and low PISA achievers. Additionally, some studies included countries that share other similarities, for example, OECD countries or countries that participated in PISA ($n=14$). We have also identified nine studies where the justification of the sample was not clear.

A considerable number of publications also include data from one specific country only in their analysis ($n=98$). The top five countries that were analysed in a single country analysis include USA ($n=25$), Turkey ($n=16$), and some of the Asian countries/territories ($n=20$). Other countries included in articles with single country analysis were UK ($n=5$), Singapore ($n=4$), Portugal ($n=3$), the Russian Federation ($n=3$), Australia ($n=3$), and the United Arab Emirates, Belgium, Norway, of which each country appeared twice. We also observed articles with data from countries that were analysed solely only once (among others, e.g., Serbia, Kazakhstan, Romania). The dominance of USA and some Asian countries to some extent reflects the origin of the authors of the articles.

Methods and study design

Regarding the software, 59 articles did not report what software had been used for the analyses. In the rest of studies, the most frequently used software was Mplus, either alone ($n=44$) or in combination with other software such as SPSS or RStudio ($n=27$). Other popular software for analysing TALIS data included Stata, HLM and SAS.

Most of the studies were correlational, in line with the cross-sectional nature of the TALIS study, in which multivariate relationships were tested ($n=161$), including multiple regression, hierarchical linear modelling or structural equation modelling (SEM). Factor analyses, both exploratory and confirmatory, were commonly used to test measurement models or to develop scales ($n=72$), and frequently such methods were used in combination with building structural equation models ($n=59$). Pure descriptive analyses were also present ($n=16$), including reporting of correlations, percentages and means, or MANOVA/ANOVA analyses. Some less frequently applied analyses were logistic regression ($n=7$), cluster analysis ($n=5$), latent profile analysis ($n=5$), latent class analysis ($n=5$), or IRT ($n=3$), to mention a few. Although cross-sectional data by nature cannot answer causal research questions, we found three studies that applied designs to support causal interpretations. One study used an instrumental variable approach (Cordero & Gil-Izquierdo, 2018), the second study used kernel causal path analysis (Zhang et al., 2021), and finally the third study used machine learning techniques to draw causal claims (McJames et al., 2023).

Knowing the importance of accounting for hierarchical data structure when analysing ILSA data (Scherer, 2022), we also address how clustering was handled in secondary analysis of TALIS. Studies were most frequently designed as multilevel ($n=88$), or as a combination of multilevel and single level analysis ($n=7$). When using multilevel analysis, the school was most frequently specified as the highest level, with country being the highest level in two or three-level models in 19 articles. Single level analyses were primarily conducted at the teacher level ($n=108$) and less frequently at the school level ($n=24$). To account for clustering at the teacher level, beyond multilevel modelling approaches, standard approaches were applied: the usage of specific software features such as those incorporated in the IEA's IDB Analyser, TYPE=COMPLEX in Mplus, or specialised packages in RStudio, as well as the usage of replicate BRR weights. Interestingly, BRR weights are used in only 14 articles, which means that most articles did not account for stratification in the sample design. In many cases, at the teacher level, though, clustering was not considered, or it was not clearly

reported how the clustering was handled ($n=47$). This issue was less pronounced with school-level data that included multiple countries ($n=20$) in which in addition to standard approaches to account for clustering, country fixed effects were also included in the models ($n=5$). It appears that researchers are in general aware that they need to consider clustering with respect to multiple countries being analysed, but less aware of the importance of including clustering due to the design where teachers are nested in schools.

Another important aspect when analysing data from TALIS is the inclusion of sampling weights that would account for unequal selection probabilities, non-response and other features of complex-survey designs. However, in our synthesis, we find that 123 articles failed to report if, or how, sampling weights had been used, whereas 114 studies reported using sampling weights. Although this synthesis did not assess the extent to which the weights had been properly used, we still observe a surprising lack of attention to the usage of weights, with more than half of the published studies failing to report or use them. This is alarming, given the importance of weights for accurate analysis of ILSA data (Laukaityte & Wiberg, 2018; Rutkowski et al., 2010).

Another important issue in analysing ILSA data is measurement invariance for analyses comparing multiple countries (Desa et al., 2018; Meuleman et al., 2022; Rutkowski & Svetina, 2014). In our sample, we had a total of 140 studies that included multiple countries, of which only a small number tested for measurement invariance ($n=24$) or reported the level of measurement invariance made available in the TALIS technical report ($n=8$). Across studies in which measurement invariance was not tested ($n=98$), the results were reported either across all included countries, known as a pooled dataset ($n=35$), country by country ($n=34$), or as a combination of the two ($n=10$). The rest of the studies used multilevel modelling with country at the highest level ($n=13$) or did not take into account the multigroup structure at all. Although likely, our synthesis does not reveal if direct comparisons were made across countries in the studies reporting results country by country.

The treatment and reporting of missing data was yet another challenge. Nearly half of the included studies ($n=114$) did not report any information regarding the extent of, and how, missing data were treated. Some studies merely stated that only complete cases were included. Among the studies that did describe how missing data was handled, the approaches used included FIML ($n=22$), imputation ($n=32$), and/or deletion ($n=53$). This is another issue that hinders the replicability of the published studies.

Thematic coverage

As described in the introduction and method section, the articles were categorised into broader themes, following an adopted version of the TALIS 2018 conceptual framework (Ainley & Carstens, 2018). The four main categories correspond to overarching themes placed within the two dimensions of focus and level. Additionally, an extra category ('Other') was introduced to account for the articles that could not clearly be classified into any of the existing categories such as innovation, equity, ICT technology, socioeconomic capital and school culture. The decision to introduce an extra category comes from the fact that certain topics, such as ICT technology or school culture, were not specifically part of the TALIS framework, while topics such as innovation and equity intersect with multiple themes including more than one level.

Overall, teacher characteristics emerged as the predominant theme, followed by teacher practices, school/principal practices and school/principal characteristics. The reader should be reminded that the numbers within parentheses indicating the specific count of articles in the topics do not necessarily sum up to the total number of articles in that theme because in several instances more than one topic within the same overarching theme was studied in the same article, where relationships between concepts were analysed. In addition, it was not rare that

topics from different overarching themes were studied together. The most frequent overlapping themes were those that included teacher practices and teacher characteristics—for example, teacher instructional practices and teacher self-efficacy (Holzberger & Prestele, 2021; Yoon & Goddard, 2023)—as well as school environmental factors and teacher/principal characteristics such as school climate and teacher job satisfaction (Chen et al., 2023) or school leadership and principal job satisfaction (Xia & O'Shea, 2023). Within the overlapping themes, there was a moderate number of articles studying principal practices, mainly focusing on school leadership, and teacher professional and instructional practices (see, e.g., Buyukgoze et al., 2022; Torres, 2019). In what follows we describe more closely each of the overarching themes.

School/principal characteristics

The school/principal characteristics theme encompasses topics related to the institutional level focusing on characteristics of schools and principals. School characteristics include topics that cover stakeholders' involvement, human resources, and school demographics. Principal characteristics are represented by the topics principal education and initial preparation, principal job satisfaction and workload stress, principal time use, and principal demographics (see Figure 5).

The original conceptual framework of TALIS summarises many of the topics that appear in Figure 5 as a part of the school leadership theme, including (1) principals' qualifications, recruitment and development; (2) principals' role, function, workload, hours and autonomy; and (3) principals' job satisfaction (Ainley & Carstens, 2018). These are, as mentioned in the TALIS framework, considered as key elements of effective leadership and ultimately as key elements of school effectiveness (Ainley & Carstens, 2018). However, we considered topics related to characteristics of principals not to be direct measures of leadership practices but as a separate theme.

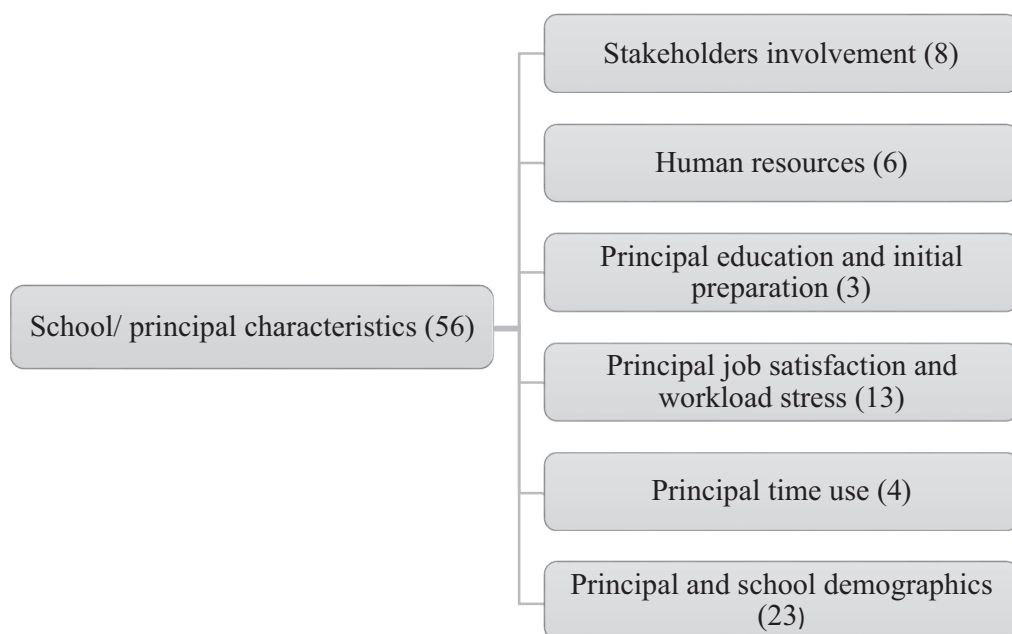


FIGURE 5 A diagram of overarching theme school/principal characteristics with number of published articles in parentheses.

The most prevalent topics within this overarching theme, in addition to the principal and school demographics, are those related to principals' job satisfaction and workload stress. Correlational studies within this theme primarily examined principal job satisfaction as an outcome variable. Thus, various predictors of principal job satisfaction, including school organisational structure and student composition (Bellibas & Liu, 2018), as well as job demands and resources (Collie et al., 2020) were of researchers' interest. These studies highlighted the significant correlation between school organisational structure and context with principal job satisfaction. Moreover, a distinct study showed that the workplace environment stands as the most powerful predictor of principals' professional satisfaction (Ning et al., 2022). Additionally, studies utilising TALIS and PISA datasets show how principal job satisfaction, studied as an independent variable, indirectly influences student learning outcomes (Huang et al., 2019; Kiliñç et al., 2022).

The group of articles within the topic of school/principal demographics included studies that looked either into specific demographical variables such as school composition (e.g., Ouwehand et al., 2022) or school type (e.g., Delprato & Chudgar, 2018) or studies including multiple demographical variables aiming to describe the wider school context. A good example of the latter is the article by Y. Liu et al. (2018) investigating how school context and principal characteristics predict distributed leadership.

The topics related to school characteristics, including human resources and stakeholder involvement, are under-investigated in the published peer-reviewed journal articles with TALIS data. The reason might be related to the fact that these two topics were not represented with specific measures in the previous cycles of TALIS. Rather, they were represented by small fragments within other topics (Ainley & Carstens, 2018). The limited number of articles that investigated these topics are mainly concerned with material resources, teacher sorting and out-of-field teaching and teachers. Other topics that are poorly investigated include principal education and initial preparation, and principal time use. It is reasonable to suggest that this smaller number of studies reflects that these are very specific and narrow topics as compared to, for instance, job satisfaction.

School/principal practices

The overarching theme of school/principal practices is placed at the institutional level, with a specific focus on various practices. This theme is less diverse in comparison to the theme school/principal characteristics, encompassing only two topics (see Figure 6). However, it is important to highlight that these two topics, school climate and school leadership, are of considerable significance within the broader context of the TALIS study, encompassing a large and complex area of TALIS research.

According to TALIS, school leadership and school climate are of importance for studies of educational policies related to school effectiveness (Ainley & Carstens, 2018). Moreover,

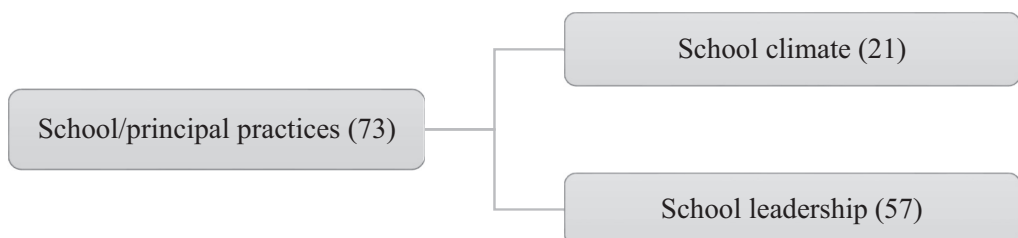


FIGURE 6 A diagram of overarching theme school/principal practices with number of published articles in parentheses.

school leadership was the top-rated theme by the participating countries when prior to the TALIS study they were asked to prioritise what to include (Ainley & Carstens, 2018). Accordingly, the attention this topic receives from the research community is not surprising. Although relatively modest with respect to school leadership indicators (three scales only in the TALIS 2018 survey), the data from TALIS are extensively used to study various topics related to leadership. Most commonly the distributed and instructional leadership conceptualisations were studied in relation to other school and teacher level constructs (see, e.g., Bellibas & Liu, 2018; Liu, 2020; Veletić & Olsen, 2021). It should also be noted that school leadership is most frequently used as a predictor (e.g., Bellibas et al., 2021; Buyukgoze et al., 2022). In the few instances where leadership is explored as a criterion variable, the studies often incorporate variables related to school and principal background (Gumus & Bellibas, 2016; Liu, 2020). This prevalent approach in leadership research, where leadership is frequently treated as an independent variable, is a widely recognised practice in the broader educational leadership field (Hallinger & Heck, 2011). However, leadership theory also posits that good leadership practice should be sensitive to the school context—for example, school safety, teacher competency and students' social conditions (Hallinger, 2018)—but currently TALIS is not explicitly designed to capture such phenomena very well.

The school climate theme was less frequently investigated in comparison to school leadership. The reason may be related to the lack of an overall school climate scale in TALIS (Veletić et al., 2023). However, in TALIS 2018, the school climate theme received a lot of attention, including new additional measures (items) such as teacher-teacher trust, common teaching beliefs, resource shortage and academic pressure (Price & Carstens, 2020). It should be noted that specific TALIS scales were used as indicators of both leadership and climate. For instance, *the participation among stakeholders scale* is sometimes used as an indicator of distributed leadership and in other instances as an indicator of specific aspects of school climate (see, e.g., Brezicha et al., 2020; Eryilmaz & Sandoval-Hernandez, 2023). On the one hand, this points to the flexibility and versatility of the TALIS data, but on the other hand it makes it difficult to properly define and communicate the construct of interest across studies. Hence, this theoretical ambiguity also makes it harder to review and synthesise research (Wang & Ahn, 2023). Moreover, these two topics are also studied together, such as in the study by Bellibas and Liu (2018), showing positive association between leadership and aspects of school climate that relates to mutual respect. The same study also showed that school delinquency and violence, also important aspects of school climate, could not be predicted by leadership style. The study conducted by Veletić et al. (2023) demonstrated a correlation between leadership styles (distributed and instructional, specifically) and the perceptions of school climate as reported by both teachers and principals. This same study revealed that, across countries, principals typically reported a stronger climate compared to teachers. Additionally, the study emphasised a more robust and reliable association between distributed leadership and climate in contrast to instructional leadership and climate. Thus, the study highlighted the significance of collecting reports from both teachers and principals concerning the same phenomena within the school. It is essential to note that this is available to only a limited number of constructs within the TALIS study.

Teacher characteristics

The overarching theme of teacher characteristics is placed in the lower left quadrant in [Table 1](#). This is a broad theme covering teachers' education and initial preparation, job satisfaction and motivation, feedback and development, self-efficacy, pedagogical beliefs, workload stress, and teacher and classroom demographics (see [Figure 7](#)).

This theme is the broadest and one of the most widely studied themes in TALIS. More than a half of the articles in our database were classified as reporting analysis of variables reflecting this theme.

Our review reflects the importance placed on teacher job satisfaction and motivation by the broader research community. This is expected given its association with several pressing issues faced by many schools worldwide, such as teachers' intention to stay in school (Skaalvik & Skaalvik, 2011), teacher turnover (Qin, 2019) and ultimately its influence on students learning outcomes (Dutta & Sahney, 2016). Our data further show that job satisfaction is often studied in relation to other teacher characteristics such as teacher motivation and teacher self-efficacy (see, e.g., Kang, 2023; Liu et al., 2023). In contrast to principal job satisfaction, the teacher job satisfaction topic has been extensively studied with TALIS data. Although principal job satisfaction in our sample is usually studied as a predictor variable, teacher job satisfaction was frequently the main dependent variable in the studies. This highlights the different roles that principals and teachers have in school. In particular, we could say that principals are mostly investigated as being drivers of the school environment that set vision and direction of the school, while teachers are the ones translating it into practice.

Another thoroughly investigated topic is the one related to teachers' self-efficacy. In TALIS, teacher self-efficacy refers to the teachers' beliefs regarding their capacity to implement specific teaching behaviours that have an impact on students' cognitive and non-cognitive outcomes and was assessed by three core dimensions: efficacy in classroom management, efficacy in student engagement, and efficacy in instruction. In most articles that investigated this topic the authors intended to predict or explain variation in teacher self-efficacy using a set of teacher, classroom, school, and principal variables. For instance, Fackler et al. (2021) demonstrated that all three domains of self-efficacy show different patterns of associations in relation to predictors at different levels in the Nordic, Anglo-Saxon, and East and South-East

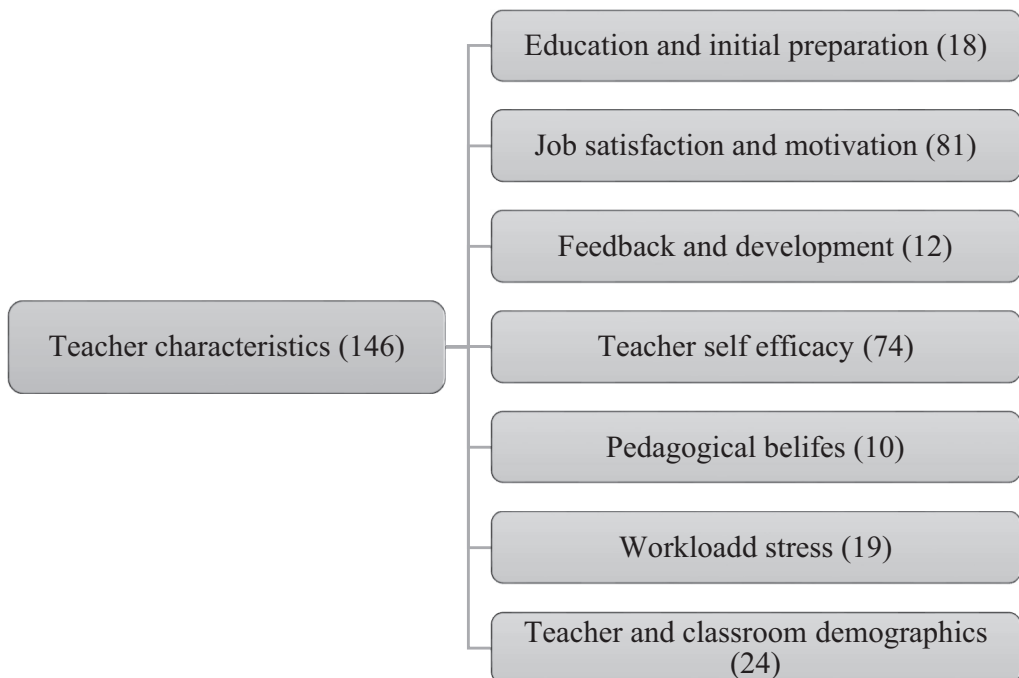


FIGURE 7 A diagram of the overarching theme teacher characteristics with number of published articles in parentheses.

Asian groups of countries. Further, Gálvez et al. (2018), in a sample of European Union countries, demonstrated that variables describing teachers as professionals were the most important in predicting self-efficacy, while institutional setting and personal traits were less important. Focusing on the East Asia region, An et al. (2021) showed that years of teaching experiences, disciplinary climate, teacher-student relationships and job satisfaction were significantly associated with teacher self-efficacy.

The topic of teachers' education and initial preparation is more modestly represented in the literature. The topic is commonly studied in relation to teacher job satisfaction and teachers' instructional practices. For instance, Jung and Woo (2022) showed that Korean teachers' preparedness is a good predictor of their self-efficacy and career motivation, but not a significant predictor of their job satisfaction. Nevertheless, they also demonstrated how self-efficacy mediates the relationship between teacher preparedness and job satisfaction. Using the US sample of social studies teachers, Wiens et al. (2022) provide evidence about the importance of teacher preparation programmes for their instructional practices.

The topic of teachers' workload stress received modest attention in TALIS. This could be due to the perception that job satisfaction and workplace stress are often seen as opposing factors. As a result, those who focused more on job satisfaction might have been less inclined to explore workplace stress. The topics 'teachers' pedagogical beliefs' and 'teacher feedback and development' also are modestly represented in the published secondary studies. It is important to note that TALIS 2013 placed a specific emphasis on teachers' pedagogical beliefs, while TALIS 2018 did not. In TALIS 2013, there was a constructivist beliefs scale that asked teachers about their personal beliefs regarding their role in the teaching process. However, this particular scale was entirely omitted in TALIS 2018. Moreover, teacher feedback and development were studied separately in TALIS 2013, whereas in TALIS 2018 the two themes were combined and studied together.

Teacher practices

Yet another popular theme within TALIS refers to teacher practices (Figure 8). This theme consists of two topics: teacher instructional practices and teachers' professional practices (Ainley & Carstens, 2018). Teacher instructional practices refer to several aspects related to what teachers do in their classrooms, commonly referred to as instructional quality. Instructional practices, therefore, represent fundamental features of teaching. There are various ways to conceptualise and operationalise instructional quality and these often include aspects related to management of socio-emotional support in the classroom, and aspects of teaching, ensuring clarity of instruction and appropriate cognitive activation (see, e.g., Senden et al., 2022). TALIS assesses instructional practices by asking teachers about disciplinary climate, clarity of instruction, feedback to students, classroom management and cognitive activation. Teacher professional practices refer

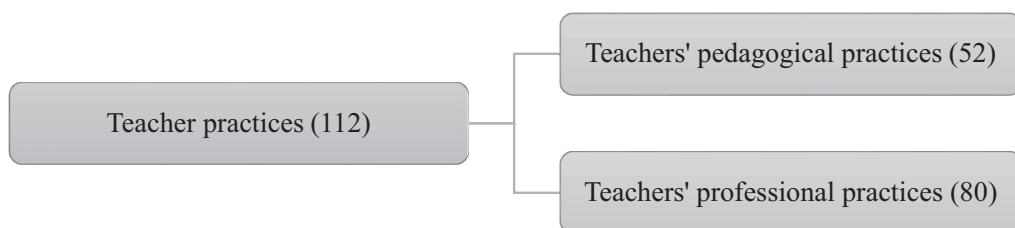


FIGURE 8 A diagram of overarching theme teacher practices with number of published articles in parentheses.

to professional activities that teachers engage with, including teacher mobility, teachers' role in decision making, professional development, collaboration, autonomy, and exchange and coordination.

Teachers' instructional quality was investigated in relation to a whole variety of variables at different educational levels and in different groups of countries. For instance, Holzberger and Prestele (2021) analysed the Austrian data in a multilevel model that highlighted the relationship between teachers' self-efficacy and dimensions of teacher quality including cognitive activation and classroom management. In the same study, they demonstrated that cognitive activation has no significant contextual or cross-level effects, while classroom management varied depending on school context (high- or low-efficacy school). Moreover, according to Ouwehand et al.'s (2022) analyses of Dutch data, the implementation of activating teaching styles, specifically cognitive activation, poses challenges in schools with a significant proportion of students from socioeconomically disadvantaged backgrounds. However, the researchers did not identify a direct negative link between teaching quality and workload. Therefore, they concluded that teachers appear to adjust their teaching methods based on the needs of their students. A more recent study of teachers from Eastern and Western worlds reports a positive relationship between teachers' job satisfaction and instructional quality and, furthermore, how this relationship is partially mediated by better student-teacher relationships (Harrison et al., 2023). Even though many studies using TALIS data looked at the overall quality of instruction by combining different aspects into one model, some researchers also separately explored the three specific dimensions of instructional quality. This is important since the construct of instructional quality significantly changed from one to the other TALIS cycle. Consequently, for example, four articles investigated dimensions such as structuring, student-oriented practices and enhanced activities that were indicators of teachers' instructional practices in the first cycle of TALIS (see, e.g., Schleicher, 2011; Vieluf et al., 2013).

Teachers' professional practices attracted even more attention than pedagogical practices, among which topics related to professional development and collaboration were most frequently investigated. Professional development was frequently investigated in relation to self-efficacy of teachers. The main findings include evidence for the benefits of teacher participation in job-embedded professional development activities such as coaching or mentoring, and teacher networks for their perception of self-efficacy (Gümüş & Bellibaş, 2023). Moreover, it has been demonstrated how professional development in multicultural education is beneficial for teachers' self-efficacy in multicultural classrooms, investigated by Choi and Mao (2021). Yet another interesting association between professional development and teacher job satisfaction received a lot of attention in the secondary analysis of TALIS. Smet (2022) used data from 24 European countries and showed a positive association between job satisfaction and professional development needs in areas such as teaching diversity and special needs students. This association is influenced by the extent to which teachers engaged in various professional development activities (Smet, 2022). However, the need for professional development in subject matter was negatively associated with job satisfaction, but less negative with increasing participation rates. Across articles in general, professional development was mostly investigated as an independent variable (Kang & Mavrogordato, 2023; Zhou et al., 2023).

Other domains of professional practices that were less investigated include teachers' autonomy (13), exchange and coordination (13), teachers' role in decision making (3), and academic mobility (2). Interestingly, TALIS attempted to develop a balanced approach with respect to teacher collaboration and teacher autonomy. The assumption is that some level of both collaboration and autonomy are beneficial for successful teacher professional development and school improvement, and TALIS provides researchers with the opportunity to empirically study how these two characteristics of teachers'

professional practices relate and how they collectively would predict other outcomes (Ainley & Carstens, 2018). Nevertheless, our findings indicate that research so far only modestly explored the theme of teacher autonomy, as compared to a larger emphasis placed on teacher collaboration.

Other themes

Several studies addressed additional themes and topics that did not fit the adopted conceptual framework. In addition to the previously mentioned themes of innovativeness and innovation (13), a few studies including the topics teacher critical thinking, school culture, teacher burnout, teacher social desirability, and teachers' information and communication technologies are placed into this 'Other' category. While some of these could be placed under the overarching themes of teacher characteristics or school/principal characteristics, these topics were never explicitly mentioned in the TALIS study frameworks and, accordingly, we found it more useful to place them in this category for miscellaneous topics outside the intended scope of the TALIS studies. This approach acknowledges that the existing TALIS framework does not cover all possible themes/topics that could emerge from secondary analysis of TALIS data.

DISCUSSION AND CONCLUSION

This study aimed to comprehensively describe the nature of current research literature in which TALIS data are used for secondary analyses. We provided summaries of bibliographical descriptives, TALIS study and sample utilised, and the data analysis methods used across the 238 articles included from our systematic search of the literature. Moreover, we highlighted the most and least explored topics among TALIS-related research, aiming to inform theory, policy and practice in the field of education. It is important to note, that we did not intend to synthesise findings or to meta-analyse effect sizes. Rather the aim was to provide a coherent and complete bibliographical overview of published secondary analyses of TALIS data. Our findings hold a particular significance for future research using the TALIS data. Although our findings likely cannot influence decisions to be made for the next TALIS study in 2024, we believe they provide information of relevance for frameworks and other documents with plans for future cycles of the study. Moreover, our summary of the existing literature would inform and guide secondary researchers about potentially well-researched themes and topics, and more importantly about possible gaps in the secondary research using TALIS data. Lastly, our review has identified a set of methodological shortcomings in parts of the literature which future research should seek to avoid.

Not surprisingly, we found that the scope of TALIS research is growing in parallel with the study's growth. According to the number of published articles, it seems that the study had a somewhat slower pace in gaining recognition and popularity among researchers as compared to the description reported in similar reviews of secondary analyses of data from PISA and PIRLS (Hopfenbeck et al., 2018; Lenkeit et al., 2015), with a bigger jump in the number of published articles after 2020, which seems to correspond to the release of the TALIS 2018 data in June 2019. After 2020, both TALIS 2013 and TALIS 2018 data were equally used for secondary research, continuing until 2023 when the dominance shifted towards TALIS 2018. Meanwhile, the importance of the earlier 2008 cycle has diminished, receiving no attention in recent years.

Most of the research included in this systematic review has been published in journals from the broader educational discipline, while journals from academic disciplines such as

psychology and sociology were less present, suggesting that researchers in the educational field are likely most familiar and concerned with the themes and topics covered by this cycle of TALIS studies. However, the interdisciplinary potential of TALIS could be more explored or emphasised particularly among those who work in the field of psychology, pedagogy, sociology and economics of education. A good example is how TALIS data are used in psychology research. The research published in the journal *Frontiers in Psychology*, one of the top five journals publishing TALIS research, were concerned with more psychology-related themes such as well-being, school violence and job satisfaction, bringing the analysis into a more specific theoretical framework of, for instance, organisational psychology (e.g., Collie et al., 2020; Yang et al., 2021; Zhang et al., 2021). We also find a specific group of authors who express a great interest in TALIS data, publishing a significant number of articles. Interestingly, this group of authors focus predominantly on studying school leadership and factors related to this major topic within TALIS.

Regarding the exploitation of data from different TALIS samples we note a huge imbalance in how much data from different populations and countries are used. Particularly, we find that data from the main population, teachers and principals in lower secondary schools, are most commonly analysed while data from populations representing primary and upper-secondary schools are underexplored. An exception is the TALIS-PISA link, which has been predominantly used to establish the link between school and teacher data with student learning outcomes. This is significant because other large-scale studies primarily focus on students, providing fewer indicators about teachers and schools. Consequently, the TALIS-PISA link is a promising approach for bridging this gap. However, the current design comes with the limitation that both PISA and TALIS independently sample students and teachers within schools. Hence, a direct teacher-student link does not exist through this dataset.

Furthermore, our analysis reveals a distinct Asia and US focus in the usage of TALIS data. It is crucial to recognise that these two groups have unique educational contexts, potentially making the findings less valid and transferable to other contexts. Moreover, data from specific countries, including Latin America, the Nordic region, East Europe and the Middle East, were less frequently analysed, which implies that the particular educational and societal context in these regions are largely neglected in the secondary analyses of TALIS—at least the part of that literature that eventually ends up as articles published in English in scientific journals. In conclusion, there is a possibility that the research literature using data from TALIS is not generalisable across very different educational contexts. Nevertheless, the potential of international large-scale studies is to identify and discuss exactly this issue. We suggest that we need more studies aiming to explore how concurrent and well-accepted theories are applicable across contexts. In order to succeed with this, more studies should not only analyse a pooled sample or a sample from one or a few specific countries. Rather, the dataset should be used to evaluate how models fit across countries, and a specifically useful approach would be to include core features of countries as fixed effects in the analyses of the full dataset. One possible limitation to this potential, at least for some of the topics included in TALIS, is the rather limited, vague and ambiguous reference to theory in the framework, suggesting also an equally limited and ambiguous representation of the theoretical concept in the constructs included in the study (Blömeke et al., 2022).

This systematic review also offers insights into the methodological strategies and approaches relevant to the analysis of TALIS data. Despite the availability of comprehensive technical documentation outlining the appropriate use of TALIS data (OECD, 2019), a concerning trend is observed in the secondary research, specifically regarding the neglect of crucial methodological considerations. To be more precise, approximately half of the studies either did not employ or failed to report if and how sampling weights were used, which is

essential to properly account for how the TALIS sampling design, involving stratification, unequal selection probabilities and clustering, affects the results. Furthermore, we observe that many articles ignored the hierarchical data structure and clustering effects. Failing to account for this hierarchical nature of the data introduces bias into the results and leads to incorrect statistical inferences. Further, our findings suggest that a practice for testing and reporting measurement invariance with ILSA data is still very uncommon. This is surprising, considering the significant emphasis placed on measurement invariance testing by the TALIS study. However, this emphasis on measurement invariance testing does not appear to expand to secondary research with the TALIS data. Consequently, we find numerous approaches to the analysis and reporting, which makes it hard to evaluate the quality and appropriateness of the studies.

Finally, we observed a significant imbalance regarding the themes that are investigated in secondary research of TALIS. On the one hand, topics concerning teachers, teacher characteristics and teacher practices have received a lot of attention. To be more precise, teacher job satisfaction and motivation, teacher self-efficacy, and teacher professional development are among the most investigated topics. School leadership is another well and thoroughly investigated theme. On the other hand, themes concerning teachers' academic mobility, and principals' characteristics, such as stress and job satisfaction, are not well covered in the secondary research. It is interesting to note that this finding is well in line with the TALIS priority rating exercise in which participating countries identified the topics that they wanted to be included in the study. For instance, in TALIS 2018 themes such as school leadership, teacher practices and job satisfaction were the top-rated themes for inclusion. However, there are exceptions to this association where, for instance, teacher self-efficacy received a low rating for inclusion by countries but is still one of the most extensively investigated topics. Furthermore, it should be noted that the distribution of journal articles across topics very likely reflects that the data is used more frequently by certain researchers representing specific interests. Based on this review, we suggest that TALIS data has an unexplored potential for research on topics related to principal characteristics, including principals' job satisfaction, workload stress, initial education and preparation, as well as topics such as how human resources are limited or used and how stakeholders are involved with schools. Acknowledging that teachers are one of the largest employee groups and that schools are one of the most frequent types of organisations worldwide, the lack of studies on these topics suggests that data from the TALIS study could be a potential resource for secondary analysis within organisational sociology and psychology. Additionally, despite the well-covered theme of teacher characteristics, we noticed that teacher feedback and initial education and preparation received less attention than other topics in this category. Similarly, within the theme 'teacher practices', teacher professional practices such as autonomy, academic mobility and cooperation have not received a lot of attention.

Alternatively, future TALIS cycles might opt to overlook some of these less-explored topics, directing their attention towards establishing more comprehensive metrics for the themes that have been receiving a lot of attention.

In conclusion, we can say that the representation of specific topics in the secondary research of TALIS is influenced by various factors, such as the authors' background and personal interests, the availability of measures, but also the quality of existing measures. Therefore, it is important to acknowledge the significance of having comprehensive and high-quality indicators within the TALIS study, especially knowing that TALIS-related research represents a major source in shaping the general wider research scope in the field of education and for policy making in the participating countries.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

All data generated or analysed during this study are included in this published article (Appendix S1).

ETHICS STATEMENT

As this study reviews published articles and did not involve research participants, no ethical approval was necessary.

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ENDNOTES

¹ UNESCO designed ISCED (International Standard Classification of Education) classification, with the most recent classification from 2011 available from <https://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>.

² We calculated the level of agreement for each code considering the four coders involved in the coding process. Because of the four coders, each specific code in a single paper had a total of six possible combinations (dis/agreements). With 10 articles, the total number of combinations across articles for a single code was 60. We calculated the agreement for each code across the 10 papers simply by dividing the number of disagreements by the total number of combinations.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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