Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training research

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Abstract

Purpose: The growing public interest in vocational education and training (VET), most recently since the economic crisis of 2007/2008, has led to an exponential increase in articles with a vocational focus, underscoring the need for review studies for the purposes of systematic knowledge aggregation, clarification and interpretation. We assume that review studies follow the same minimum standards as other research methods: the review must be at least reproducible and thus the results verifiable or falsifiable. So far, however, the review methods used in VET research have not been investigated. Our purpose is to review the review procedures and methods used in published reviews of VET research to identify their current methodological quality.

Approach: To classify the review studies, we initially developed a conceptual framework to distinguish different types of reviews. We then developed a methodological framework to assess the review methods used. Overall, to accelerate the review process, our review of reviews (or umbrella review) followed the rapid review approach: we limited our search to reviews in English published between 2014 and 2019 in peer-reviewed journals with a substantial VET focus and indexed in Scopus and/or Web of Science. Therefore, we did not examine all existing reviews in the field of VET research. Rather, our specific focus was on a core sector of scientific research: peer-reviewed articles in curated databases. Furthermore, we concentrated on the review procedures and methods used, not on the content of the reviews.

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Findings: We identified nine journals with a substantial VET focus, yielding a total of 1,283 published articles between 2014 and 2019, of which only 19 articles (1.48%) were literature reviews. Of these 19 reviews, six were excluded from our umbrella review because of unclear methodological procedures. Based on the review typology we developed, five of the remaining 13 reviews were conceptual in nature, four were scoping reviews, three were evidence-oriented, and one was critical in nature. None of the reviews examined focused on meta-syntheses, research methods or meta-analyses. In total, this resulted in current review gaps with respect to theory generation (meta-synthesis), practice of theory elaboration and testing (methodological review) and the determination of overall effects across single studies (meta-analysis). Finally, our examination of the reviews showed that their scope was mostly clearly presented. However, with regard to the process steps *data selection* and *data processing*, only a few reviews fully met the requirements of the methodological framework.

Conclusion: Our review leads to four conclusions. 1) More systematic syntheses are needed because there is a substantial quantitative gap in review research. 2) In particular, there is a need for review studies with a focus on meta-synthesis, research methods and meta-analysis, as there is a current gap in these areas. 3) Reviews should be based on a review methodology with transparent and reproducible methods and verifiable or falsifiable results. The high number of subjective syntheses with unclear review procedures indicates that this mindset is not yet fully established in the field of VET research. 4) In the studies examined, there is a high degree of heterogeneity regarding to the accuracy and completeness of the methodological steps and data. The conceptual and methodological frameworks developed for the analysis can serve as guidelines for the conduct of reviews, and thus, the frameworks could contribute to the further development of the methodological basis of reviews.

Keywords: Literature review, umbrella review, review of reviews, typology, vocational education and training, VET

1   Research problem and research question

Since the financial crisis of 2007/2008, at the latest, vocational education and training (VET) has gained a high degree of attention, as it is often perceived as a solution to socioeconomic problems following financial crises, particularly the rise of youth unemployment. VET is also viewed as an instrument for increasing an economy's productivity, capacity for innovation and competitiveness (Chankseliani & Anuar, 2019; Gessler, 2019; Salvà et al., 2019).

1.1 Increased research on vocational education and training

This multifunctionality of VET has not only led to a high degree of attention but also to an exponential (R^2 = 0.9427) growth in the number of VET-related articles (N with vocation* in the title, cumulated until 2018 = 14,088), which has resulted in the need for literature reviews. Literature reviews are "systematic syntheses of previous work around a particular topic" (Card, 2010, p. 725). The number of literature review articles (N with vocation* and review in the title, cumulated until 2018 = 144) has also grown exponentially to a similar extent (R^2 = 0.946), although there is a dearth of review syntheses (Figure 1).
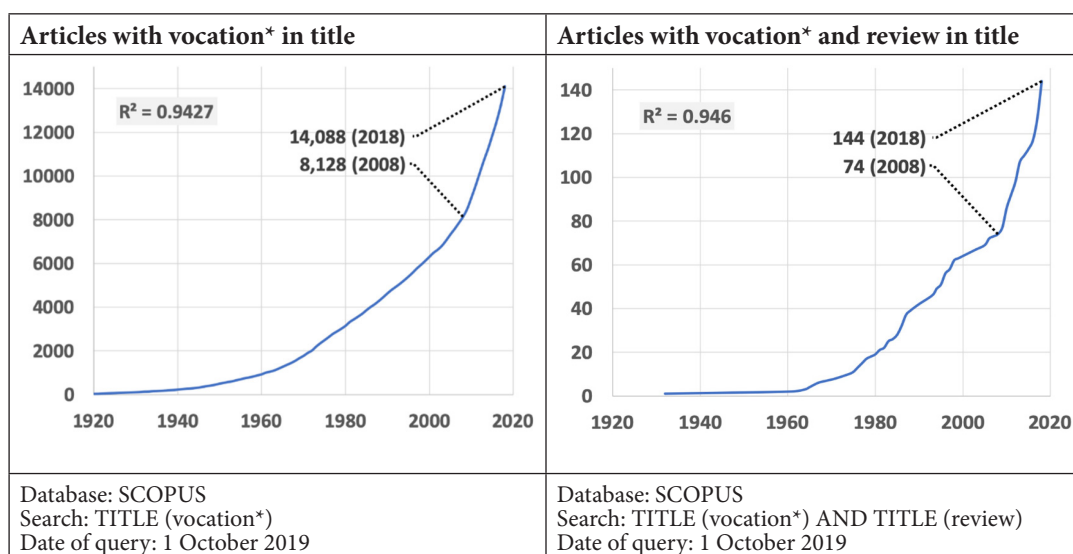
Articles with vocation* in title	Articles with vocation* and review in title
R^2 = 0.9427 14,088 (2018) 8,128 (2008)	R^2 = 0.946 144 (2018) 74 (2008)
Database: SCOPUS Search: TITLE (vocation*) Date of query: 1 October 2019	Database: SCOPUS Search: TITLE (vocation*) AND TITLE (review) Date of query: 1 October 2019

Figure 1: Cumulated VET-related articles and reviews up to 2018

The lack of systematic knowledge synthesis is obvious, but the methodological quality of the literature reviews is not evident. Is the existing review corpus small but excellent? We use the review of reviews or the umbrella review approach (Grant & Booth, 2009) to assess the methodological quality of the existing reviews. Our overall research question is as follows: ***what is the methodological quality of reviews with a VET-related focus?***

1.2 Methodological quality of reviews: reproducibility

In recent years, there has been evidence showing that "many science studies are not reproducible" (Sayre & Riegelman, 2018, p. 2). The so-called *reproducibility crisis* sets the frame for the definition of methodological quality used here: review studies have to be at least repro-

ducible. In this paper, we use the following definition: "Reproducibility refers to the ability of a researcher to duplicate the results of a prior study using the same materials and procedures as were used by the original investigator" (Bollen et al., 2015, p. 3). Reproducibility requires transparency, especially by "providing methodological details of research" (Bollen et al., 2015, p. 22). Applying the definition of Bollen et al., (2015), every literature review requires methodology and explicity as the minimum criteria to enable transparency and reproducibility (Figure 2).
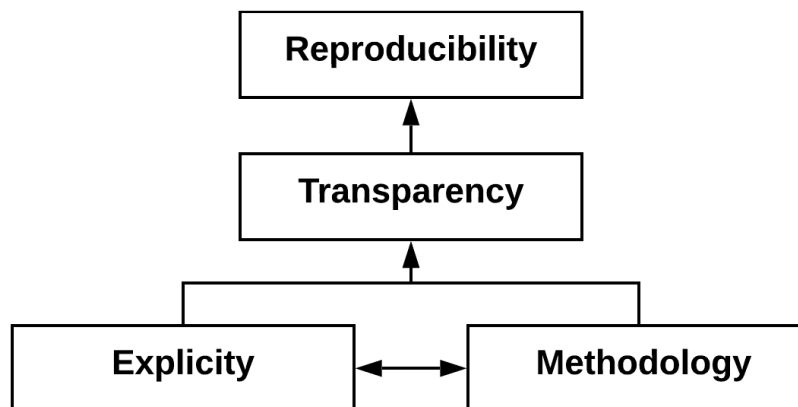

Figure 2: Reproducibility as a minimum requirement for literature reviews

Our research question can now be specified as follows: which methodological details are explicitly provided in literature review studies with a VET-related focus, and which ones are not? We expect that this research question is sufficiently broad to be inclusive of all types of literature review studies with a transparent methodology (Gough et al., 2012b).

The overall purpose of our umbrella review is an assessment for which a conceptual framework is required. The first step is, therefore, to clarify the concept of a review to set the frame for the assessment.

2   Literature review: definition and epistemology

2.1   Literature review

The label *literature review* is often used in two respects, first, as a *categorial term* to distinguish among review categories (e.g. literature, financial, workflow and employee performance) and, second, as a *specific term* to distinguish among literature review types. Grant and Booth (2009) developed an influential typology with 14 types of reviews. They defined a literature

review (as a specific term) as follows: the "common characteristics are that a literature review reviews published literature, implying that included materials possess some degree of permanence and, possibly, have been subject to a peer-review process" (Grant & Booth, 2009, p. 97). This broad definition is appropriate for all literature review types. The authors stated that a literature review as a review type is a "generic term" (p. 94). While the label classifying a review category is appropriate, its usage in classifying a review type within this category is problematic. Therefore, we use the literature review label only as a categorial term. Another review type in Grant and Booth's typology, the overview, is also a "generic term" (p. 94), and for us, it is also a categorial term, not a specific term for a review type.

2.1.1 Definition

Hart (2018) subdivided a *literature review as a categorial term* into two stages: search of the literature and review of the literature. A literature review starts with

> a systematic search of the accredited sources and resources. It involves identifying paper and electronic sources relevant to your topic and method(s) by preparing a clear plan for the search that includes a justifiable vocabulary that defines what will and will not be included in the search. (p. 3)

The review of the literature is

> the analysis, critical evaluation and synthesis of existing knowledge relevant to your research problem. ... In your analysis, you are selecting from different texts, concepts, theories, arguments and interpretations that seem to be relevant to the development of your particular theoretical frame of reference and/or use of a particular methodology. It involves classifying these parts into schemes that enable you to critically evaluate those concepts, arguments and different interpretations. (pp. 3–4)

The synthesis of existing knowledge is "the act of making connections between the parts identified in the analysis. It is not simply a matter of reassembling the parts back into the original order, but looking for a new order" (p. 197). A literature review, therefore, contains at least the following basic steps: (1) definition of the scope (specify the research problem and the research question); (2) data selection (define the sources and the search terms, and include the relevant research); (3) data processing (analysis: select from different texts, and critically evaluate the extractions; synthesis: pool the extracted data).

Grant and Booth (2009) also focused on the "processes required in completing a review" (p. 104) and identified four "main phases of each review type" (p. 106), "namely search, appraisal, synthesis and analysis" (p. 104). Prior to the synthesis and analysis, the authors situated the *appraisal* task, whose function is to evaluate the quality of research *before* it is included in the body of pooled knowledge. Poor research can, therefore, be excluded. Based

on a government-funded initiative to apply systematic research synthesis in education, the reviewers identified "particular gaps in the methodology of research synthesis, among which the lack of agreed quality criteria for establishing the validity and reliability of 'qualitative' research is probably the most critical." (Oakley, 2002, p. 279). Grant and Booth accordingly stress the importance of quality appraisal: "However, whether the evidence takes the form of primary or secondary studies, it is equally important to undertake an appraisal of quality. This should consider both its robustness (validity and reliability) and its relevance to the local context (applicability)." (Grant & Booth, 2009, p. 104). The authors also reordered the steps and positioned the analysis after the synthesis. In a later publication, Booth et al., (2016b, p. 172) justified this inverse order with reference to the need for a meta-analysis. Coughlan and Cronin (2017) also included the *critical appraisal* step and the *re-analysis of the pooled data* task (p. 45), though *within* the *data synthesis* step. Their proposal was not limited to a meta-analysis. Coughlan and Cronin (2017) also extended the *systematic search step to search and eligibility screening* and added the final step, which comprised the *conclusion, discussion and limitations.*

Based on the definition of Card, that literature reviews are "systematic syntheses of previous work around a particular topic" (2010, p. 725), we can now extend Hart's (2018) framework to define our understanding of a literature review. To conclude, a literature review contains the following steps: (1) definition of the scope (specify the research problem and research question); (2) data selection (systematic search and eligibility screening: define the sources and search terms, include the relevant research, and screen and read the selected research to exclude the ineligible research); (3) data processing (critical appraisal: assess the quality of the selected research to exclude poor or inappropriate research; analysis: select the relevant data from the different texts, and critically evaluate the extraction; synthesis: synthesise and re-analyse the pooled data) and (4) data reporting (present the findings, and discuss the conclusions and limitations of the review). This is not the definition of a special literature review type but a *categorial definition* of a literature review.

2.1.2 Systematic and subjective syntheses

We are aware that the methodological requirements defined herein are not typical of subjective reviews, which "tend to be idiosyncratic. Subjective reviews choose articles without justifying why they are selected, and they may give equal credence to good and poor studies. The results of subjective reviews are often biased on a partial examination of the available literature, and their findings may be inaccurate or even false" (Fink, 2020, p. 16). Fink distinguished *narrative reviews* from these subjective reviews. A narrative review may be appropriate "for describing the history or development of a problem and its solution" (p. 16). The purpose of a narrative review is "to identify a few studies that describe a problem of interest.

. . . No standards or protocols guide the review. Although the reviewers will learn about the problem, they will not arrive at a comprehensive understanding of the state of the science related to the problem" (Demiris et al., 2019, p. 32). Therefore, also a narrative review "is very subjective depending on what you select, how you choose to use what you found, and how you choose to frame it. It's all subjective. . . . so when you look at the quality of a narrative review, a lot of times who wrote it comes into play" (interview with Margaret Foster[1], as cited in Wang, 2019, p. 4). Subjective and narrative reviews are thus comparable in their approach, which is why we characterize both as subjective syntheses.

In this umbrella review, we do not examine the expertise of the reviewer (an experienced or inexperienced scholar). Instead, in line with our research question, we focus on the "increasing emphasis on reviews that are methodical" (Coughlan & Cronin, 2017, p. 12). Therefore, we distinguish between (1) *systematic syntheses* based on an explicitly described methodology of searching, selecting and synthesizing the relevant body of knowledge and (2) *subjective syntheses* which lack such methodology. Only reviews with an explicitly described methodology are eligible for this umbrella review (Figure 3).

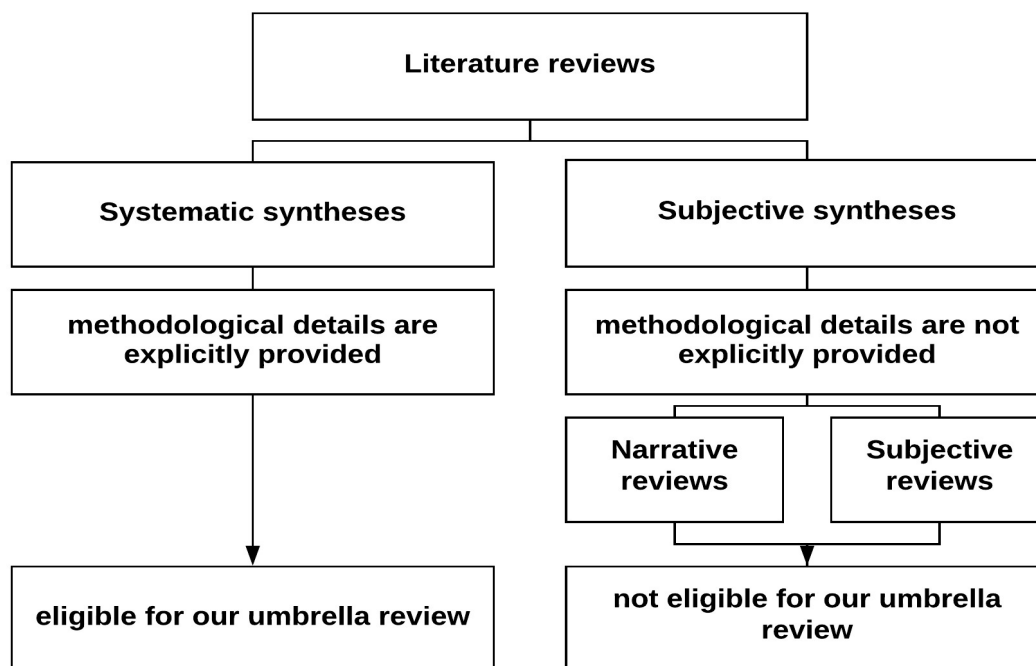

Figure 3: Systematic and subjective syntheses

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1 Margaret Foster is the "co-author of the only book written on systematic reviews for librarians, *Assembling the Pieces of a Systematic Review: A Guide for Librarians*" (Wang, 2019, p. 2).

An example of a subjective synthesis is a recently published literature review about major strands of African VET literature and emergent approaches. The review was written by a team of experts in the field. However, its methodological foundation – e.g. the selection of literature, the identification of the major and emergent approaches, the qualitative analysis and synthesis – is unclear. According to the authors, the "article draws on team members' experiences of previous attempts to summarise the literature on VET in Africa" (McGrath et al., 2019, p. 3). The lack of methodological explanations has three consequences. (1) The findings are difficult to classify and value. (2) It is difficult to reproduce the review and to verify the findings. (3) A systematic widening or updating of the findings is difficult, even for the authorial team. The tacit methodology is situated and socially embedded in the configuration of the team.

Excluding subjective syntheses from our umbrella review does not mean that these reviews, in general, or the excluded reviews, in particular, are not valuable. But, the excluded reviews (Figure 5) were ineligible within the focus of this study.

2.1.3 Inappropriate terms

Descriptions are basic aspects of reviews and are used in many review types. A description "tells us how things are. It is not an argument. It is an account, always written from a certain point of view, to some purpose. A description doesn't explain" (Jesson et al., 2011, p. 66). As such, we use *descriptive review* not as a specification for one review type. The terms *analytical review* and *synthesis review* are also inappropriate for specifying review types. Analysis and synthesis are key elements in every review. The purpose of a literature review, as a second-order research, is to analyse and synthesise existing research. The other terms that are sometimes used – *state-of-the-art review, systematised review* and *systematic search and review* – are also generic characterisations, as pooling the state-of-the-art research is a central purpose of every second-order research. Thus, an explicit methodology is a basic requirement for eligibility in this umbrella review. The term *systematic review* is nevertheless included in our typology because specific methodologies were developed for this review type (e.g. Moher et al., 2009; Petticrew & Roberts, 2006; critical: MacLure, 2005). In Table 1, we summarise the terms that we later not use to specify our review types.

Table 1: Generic or inappropriate terms

Term	Reason for not using the terms to specify review types
Literature review	Generic term
Overview	Generic term
Descriptive review	Descriptions are used in different types of reviews
Analytical review	Conducting an analysis is a basic requirement for every review
Synthesis review	Conducting a synthesis is a basic requirement for every review
State-of-the-art review	Identifying the state-of-the-art research is a basic purpose of every review
Systematised review	Systematic work (or systematised work) is a basic prerequisite for any research
Systematic search and review	

In the first step, we defined literature review as a categorial term. In the second step, we distinguished literature reviews with an explicit methodology from those with an unclear methodology (subjective reviews and often narrative reviews). In the third step, we identified inappropriate terms. In the next step we will examine the epistemological principles underlying the literature review in order to have a basis for the development of our typology.

2.2   Epistemological foundation

According to Toye et al., "a central distinction between synthesis approaches is (a) those that that aim to describe or 'aggregate' findings and (b) those that aim to interpret these findings and develop conceptual understandings or 'theory'" (2014, p. 4). Barnett-Page and Thomas (2009, p. 9) followed the same idea, though with a different purpose. They did not focus on purposes (e.g. aggregation) but on the underlying epistemologies and named their pair of opposites as *realist* and *idealist*. They *did not make a distinction* and assumed that "it is generally a question of degree rather than of absolute distinctions" (Barnett-Page & Thomas, 2009, p. 9). In Table 2, we summarise the two extreme epistemological positions (idealist and realist) and add the purposes (Toye et al., 2014) and basic review types (Booth et al., 2016b) that are grounded on these epistemologies.

Table 2: Realist and idealist epistemologies

Epistemologies	Idealist	Realist
(Barnett-Page & Thomas, 2009)		
Searching	Iterative	Linear
Quality assessment	Less clear, less a priori; quality of content rather than method	Clear and *a priori*
Problematising the literature	Yes	No
Question	Explore	Answer
Heterogeneity	High	Low
Synthesised product	Complex	Clear for policy makers and practitioners
(Toye et al., 2014)		
Purpose	"interpret . . . findings and develop conceptual understandings or 'theory'" (p. 4)	"describe or 'aggregate' findings" (p. 4)
(Booth et al., 2016b)		
Basic review types	Interpretive/configurative reviews "seek to broaden our understanding of a particular intervention or phenomenon. Each study holds the potential to contribute additional insights and also contribute to the overall picture" (p. 22).	Aggregative reviews "bring together studies on a similar topic such that each additional study adds 'weight' to a shared finding. Bringing studies together in this way necessitates assumptions about how similar studies are to one another (homogeneity)" (p. 22).

Following the idea of a continuum, a purpose between the idealist and realist camps can be identified, which we call *clarification*. This purpose is based on the interpretation and/or aggregation of prior findings for the purpose of clarifying a concept or method as a basis for further development of a theory or methodology. Some helpful umbrella reviews focus on clarification of methodological basics (e.g. Booth et al., 2016a; Grant & Booth, 2009).

3 Conceptual framework of literature reviews

Our conceptual framework (Imenda, 2014) is based on Barnett-Page and Thomas (2009) realist–idealist continuum, from which we make distinctions regarding the review purposes of interpretation, clarification and aggregation.

In section 2, we identified generic, ineligible and inappropriate terms. Without these terms, we are left with the following review types from Grant and Booth's (2009) typology: critical review, mapping review, meta-analysis, mixed studies review, qualitative systematic review, rapid review, scoping review, systematic review and umbrella reviews. In our typology, we did not distinguish between *qualitative systematic review* and *systematic review*. Although different, they belong to the same review type, which we call *systematic review*. For the

same reason, we grouped *mapping review* and *scoping review* under one review type. With the remaining specific review types, we developed our integrated conceptual framework based on the epistemologies, basic review types and purposes presented in Section 2.

Grant and Booth (2009) developed their typology inductively and used published review studies as the bases for their analysis. This approach produced theoretical gaps, as it relates to a given and selected practice. In our framework, we added four review types to fill the gaps: meta-meta-analysis, methodological review, conceptual review and meta-synthesis. Figure 4 presents the integrated conceptual framework with the different review types.
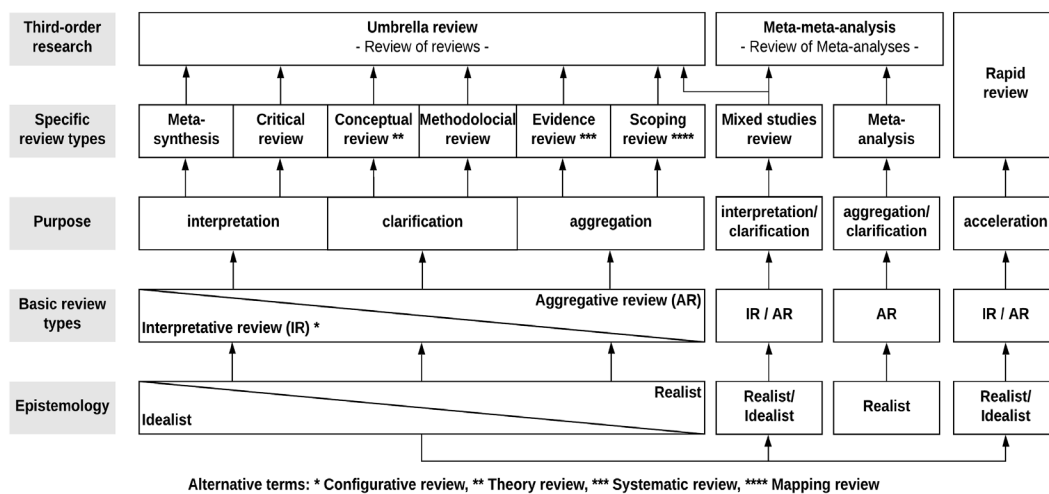
Figure 4: Integrated conceptual framework

These different review types can be used as a single approach, as a sequentially combined approach or as a methodologically combined approach. For example, a review can start sequentially as a meta-synthesis and move on to a critical review. The rapid review approach, on the other hand, is not a stand-alone method, but only possible in combination with another approach (e.g. conceptual review). In Table 3, we summarise the definitions of the different types of methodological literature reviews in our integrated conceptual framework.

Table 3: Definitions of reviews

Purpose	Review type	Definition
Interpretation	**Metasynthesis**	It "is more than a summing up of research findings; it involves analyses and theory generating syntheses that remain faithful to the interpretive rendering in each study . . . Metasynthesis is defined as interpretive synthesis of data, including phenomenologies, ethnographies, grounded theories and other integrated and coherent descriptions or explanations of phenomena, events or cases" (Bondas & Hall, 2007, p. 115).
	Critical review	It "aims to demonstrate [that the] writer has extensively researched [the] literature and critically evaluated its quality. [It] goes beyond mere description to include degree of analysis and conceptual innovation. [It] typically results in [a] hypothesis or [a] model" (Grant & Booth, 2009, p. 94).
Clarification	**Conceptual review** *Alternative term: Theory review*	Conceptual reviews examine concepts "in order to clarify their characteristics, thereby achieving a better understanding of the meaning of [those] concept[s]" (Coughlan & Cronin, 2017, p. 158). The review can also focus on a broader framework, a system of concepts, a theory. A theory review "could have one or more of the following aims: identifying and mapping a comprehensive range of relevant theories; assessing which theories have become influential and which have been, or have become over time, largely overlooked; and integrating complementary theories and facilitating the analysis and synthesis of theories into more generalised or abstract 'meta-theories'" (Campbell et al., 2014, p. 2).
	Methodological review	"The purpose of the methodological review is to understand the quality of the research by systematically analyzing the various research components of each study and synthesizing the quality of the research methods across the body of studies" (Krezmien et al., 2017, p. 105).
Aggregation	**Evidence review** *Alternative term: Systematic review[2]*	It is "a process that uses an explicit and transparent methodology to re-analyse and synthesise evidence from previously conducted research studies on a given topic" (Coughlan & Cronin, 2017, p. 163).
	Scoping review *Alternative term: Mapping review*	"A scoping review or scoping study is a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesizing existing knowledge" (Colquhoun et al., 2014, p. 1292 f). "Scoping reviews have great utility for synthesizing research evidence and are often used to map existing literature in a given field in terms of its nature, features, and volume. As such, scoping reviews have also been called 'mapping' reviews" (Peters et al., 2015, p. 141). Limitation: "They do not, for example, appraise the quality of evidence in the primary research reports in any formal sense" (Arksey & O'Malley, 2005, p. 30). Reporting: Tricco et al., 2016

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2 We prefer the term "evidence review" (Munn et al., 2018) because this term indicates the subject or *what* of the review, not the method or *how* of a review. Moreover, if one review type claims to be systematic, this would mean that all other review types do not meet this requirement. We have nevertheless used the term "systematic review" (as an alternative term) because specific procedures exist for this type of review and it is popular and widely used (especially in medicine).

Interpretation and clarification	Mixed studies review	A review of mixed studies "refers to any combination of methods where one significant component is a literature review (usually systematic). Within a review context, it refers to a combination of review approaches, for example combining quantitative with qualitative research or outcome with process studies" (Grant & Booth, 2009, p. 94).
Aggregation and clarification	Meta-analysis	It is a "technique that statistically combines the results of quantitative studies to provide a more precise effect of the results" (Grant & Booth, 2009, p. 94).
Process acceleration	Rapid review	The rapid review approach is a type of systematic syntheses in which "review processes are accelerated and methods are streamlined to complete the review more quickly" (Langlois et al., 2017, p. 3). Methods are either reduce the research scope, focused search strategies, or focused methods for the data extraction, analysis and synthesis (Ganann et al., 2010).
Review of reviews	Umbrella review	It "specifically refers to [a] review compiling evidence from multiple reviews into one accessible and usable document. [It] focuses on [a] broad condition or problem for which there are competing interventions and highlights reviews that address these interventions and their results" (Grant & Booth, 2009, p. 95).
Review of meta-analysis	Meta-meta-analysis	A "meta-meta analysis uses as its basic data individual meta-analyses. By using meta-analysis as the individual unit of study (subject), much greater generality is afforded. The reason for this is that a meta-meta analysis takes into account more techniques . . . and subjects than all previous methods of evaluation; it integrates research through statistical analysis of individual studies" (Kazrin et al., 1979, p. 397).

In the following section, we use the generic definition of a literature review from section 2 to develop our methodological framework for the review of reviews.

4 Methodological framework of literature reviews

Following our definition, a *literature review* contains the following steps: (1) definition of the scope (specify the research problem and research question); (2) data selection (systematic search and eligibility screening: define the sources and search terms, include the relevant research, and screen and read the selected research to exclude the ineligible research); (3) data processing (critical appraisal: assess the quality of the selected research to exclude poor or inappropriate research; analysis: select the relevant data from the different texts, and critically evaluate the extraction; synthesis: synthesise and re-analyse the pooled data) and (4) data reporting (present the findings, and discuss the conclusions and limitations of the review). This is not the definition of a special review type but a *categorial definition* of a literature review. Based on these steps, we developed a methodological framework to assess the methods used. We developed our framework in three steps: (1) synthesising existing approaches (Aromataris & Pearson, 2014; Aromataris et al., 2015); (2) selecting the methodological criteria (Sny-

der, 2019) and (3) adjusting the criteria (Strandberg & Simpson, 2019). The full framework is presented in Table 4.

Table 4: Methodological framework of literature reviews

Process step		Elements	Items
1	Scope definition	research problem	research problem is clearly reported*
			research problem is embedded in the context of what is already known
		research question	objectives (purpose of review) are clearly reported*
			research questions are clearly reported
2	Data selection	sources	the selected sources (e.g. databases) are clearly reported*
			the reasons for the source selection are clearly stated
		search	the search strategy is clearly reported
			the search terms and limits are clearly reported
		eligibility	the process of screening (title, abstract) and full text reading is clearly reported
			the reasons for the inclusion of studies are clearly stated*
			the reasons for the exclusion of studies are clearly stated
			an overview (e.g. flow diagram) is given including the steps identification (search) and eligibility, the numbers of included and excluded studies and the rationale (criteria) for the exclusion of studies.
3	Data processing	appraisal	criteria or used checklist for the appraisal of the studies is clearly reported
			how the appraisal was done is clearly reported
			excluded studies are clearly reported and the reasons for the exclusion of studies are clearly stated
		analysis	method(s) of data extraction from reports is clearly reported*, and the reason/s for using it is/are clearly stated
			method(s) of analysis is clearly reported, and the reason/s for using it is/are clearly stated
			the result of extraction and analysis is critical evaluated
		synthesis	method(s) of synthesizing the analysis results are clearly reported*
			method(s) of re-analysis (if appropriate) of the synthesis results are clearly reported
			the relation between synthesis results and research question is clearly reported
4	Data reporting	findings	summarized findings are clearly reported
			limitations of the study and findings are clearly reported
		conclusion	a general interpretation of the results in the context of other studies is provided
			implications for future research are provided
* criteria used in the appraisal checklist (Table 7)			

This framework should be seen as a minimum standard. Further steps and criteria could be added (e.g. Aromataris et al., 2015; Moher et al., 2009).

5 Review of reviews: rapid methodological umbrella review

Our review type is, first and foremost, an umbrella review, as our primary purpose is to review existing reviews (Aromataris et al., 2015). Second, we employed the rapid review approach by applying two focused search strategies to accelerate the process (Langlois et al., 2017). (a) Source strategy: we identified the journals and articles by using two databases (Scopus and World of Science). (b) Limitation strategy: we concentrated our search on articles in peer-reviewed journals, which were published in English between 2014 and 2019 in journals with a substantial VET focus. Thirdly, we have analysed the review methods used. Our review is therefore a methodological review (Krezmien et al., 2017).

The following sections describe the details about these combined approaches. The process is directed by the steps outlined in Table 4.

5.1 Scope definition

5.1.1 Research problem

We described the research problem in section 1 as a discrepancy between increased VET-focused research, on the one hand, and only a few synthesizing studies, on the other. While this quantitative shortfall is evident, what is not evident is whether the methodological quality of the reviews is appropriate to fulfil the central methodological task of research, i.e. transparency, reproducibility and verifiability/falsifiability.

5.1.2 Research question

Our objective is to identify the methodological quality of reviews in VET and to clarify the methodological foundation of a selected corpus of recent reviews. Our research question is: which methodological details are explicitly provided in literature reviews published in peer-reviewed journals with a substantial VET focus, and which ones are not?

5.2 Data selection

5.2.1 Sources

We included in our restricted search two curated databases: Elsevier's Scopus and Clarivate's Web of Science (WoS). Both databases index peer-reviewed literature that have been accepted for inclusion following an internal review (SCOPUS: Content Selection and Advisory

Board; WoS: inhouse editors). After the inclusion, the journals remain under permanent review. The continuous review of the corpus is important because some journals change after inclusion into "predatory journals" (footnote 4). Both databases index documents from different publishers – the content is publisher-independent. In a more comprehensive search, further databases could be included, such as ERIC (Education Resources Information Center), VOCEDplus (Vocational Education and Training Research Database), JSTOR (Journal STORage), databases from ProQuest (e.g. Education Collection, Social Science Database) and EBSCO (e.g. Education, Research Complete, Business Source Complete), subject-specific databases (PsycINFO, PSYNDEX, SocINDEX), cross-country databases (ASEAN Citation Index, LatinIndex Sistema Regional de Información en Línea para Revistas Científicas de América Latina, el Caribe, España y Portugal), country-specific databases (e.g. CHSSCD Chinese Humanities and Social Sciences Citation Database, PEDOCS Pedagogical Documents, Germany) and publisher-specific databases (e.g. ScienceDirect, Taylor and Francis Online). An additional search approach could be the use of academic search engines, such as Google Scholar and Microsoft Academic (Rovira et al., 2019), or scholarly citations engines, such as Crossref and Dimensions (Harzing, 2019).

5.2.2 Search

In the first step, we identified journals with a substantial VET focus for inclusion in our search. The focus on VET was identified by dividing a ratio between the total number of articles (in a certain time) and the total number of articles with a vocational topic. In the second step, we identified the articles with review in the title within these journals. These steps will now be explained in greater detail.

Identification of journals for inclusion

First, we identified SCOPUS articles published between 2014 and 2018 in English and in the subject area of social sciences, with vocation* in the title, abstract or keyword[3]. The search (15 June 2019) resulted in 3,870 records. From the journal list, we selected the twenty journals with the highest number of VET-related articles and calculated a ratio to identify the VET profile of the journal: 1) total number of VET-related articles (2014–2018) divided by the 2) total number of published articles (2014–2018). This 3) ratio indicates the VET focus of a journal. We set the cut-off value for the ratio at 0.20. Of the identified journals, nine met this criterion and were included in our search. The results of the selection are shown in Table 5.

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3 DOCTYPE(ar OR re) AND PUBYEAR > 2013 AND PUBYEAR < 2019 AND LANGUAGE(English) AND SUBJAREA(soci) AND TITLE-ABS-KEY(vocation*)

Table 5: Journals with VET-focused articles and the identified VET-focus

	Journal	1)	2)	3)	4)	5)
1	*Journal of Vocational Education & Training (JVET)*	145	145	1.00	**incl.**	**7**
2	*International Journal for Research in Vocational Education and Training (IJRVET)*	73	73	1.00	**incl.**	**2**
3	*Empirical Research in Vocational Education and Training (ERVET)*	62	74	0,84	**incl.**	**2**
4	*Journal of Vocational Behavior*	62	445	0.14	excl.	
5	*Vocations and Learning (VL)*	56	92	0.61	**incl.**	**2**
6	*International Journal of Training Research (IJTR)*	49	87	0.56	**incl.**	**0**
7	*Journal of Education and Work (JEW)*	45	210	0.21	**incl.**	**2**
8	*BMC Medical Education*	43	1422	0.03	excl.	
9	*Education and Training*	42	309	0.14	excl.	
10	*Research in Post Compulsory Education (ROCE)*	39	153	0.25	**incl.**	**2**
11	*Nurse Education Today*	29	1333	0.02	excl.	
12	*Review of European Studies*	29	392	0.07	excl.	
13	*World Transactions on Engineering and Technology Education*	28	498	0.06	excl.	
14	*Journal of Career Development*	27	261	0.10	excl.	
15	*Mathematics Education*	27	283	0.10	excl.	
16	*Eurasia Journal of Mathematics Science and Technology Education*	26	1256	0.02	excl.	
17	*Journal of Technical Education and Training (JTET)*	25	47	0.53	**incl.**	**1**
18	*Pertanika Journal of Social Sciences and Humanities*	23	1254	0.02	excl.	
19	*International Journal for Educational and Vocational Guidance (IJEVG)*	21	88	0.24	**incl.**	**3**
20	*Academic Medicine*	19	1399	0.01	excl.	
Total					**9**	**21**

1) Number of articles between 2014 and 2018 with vocation* in title, abstract or keyword (database query: 15 June 2019); 2) total number of published articles between 2014 and 2018 (database query: 15 June 2019[4]); 3) ratio (VET focus); 4) included journals: (ratio > 0.2); 5) number of articles with the term review in the title between 2014 and 2019 (last database query: 15 January 2020).

In a second step, we cross-checked the results by conducting the same search in Web of Science (WoS), with vocation* as a topic (title, abstract or keyword), and limited the results to articles published in English between 2014 and 2018 in the subject area of education and educational research[5]. Articles from other subject areas and in other languages were again

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4 Six journals were excluded in this step because they a) were no longer indexed in Scopus and were b) named on the list of possible predatory (hijacked) journals/predatory publishers (https://predatoryjournals.com): Turkish Online Journal of Educational Technology (excluded from Scopus in 2017), International Journal of Environmental and Science Education (excluded from Scopus in 2016), Man in India (excluded from Scopus in 2017), Asian Social Science (excluded from Scopus in 2015), Mediterranean Journal of Social Sciences (excluded from Scopus in 2015) and Advanced Science Letters (excluded from Scopus in 2017).

5 Scopus does not offer "education" as a subject area in searches, and Web of Science does not offer "social sciences" as a category in searches. "Subject area" (Scopus) and "category" (WoS) have the same function.

excluded. The search (dated 15 June 2019) resulted in 1,461 records. From the journal list, we again selected twenty journals with the highest number of published VET-related articles and conducted the same calculation as above to determine a VET ratio to identify the VET-focus of the journal. The search confirmed the already identified journals. However, none of the additional journals identified fit the criteria for inclusion. The excluded journals were: Higher Education Skills and Work-based Learning (0.15), Studies in Continuing Education (0.11), Research in Comparative and International Education (0.10), International Journal of Lifelong Learning (0.06), British Educational Research Journal (0.04), Community College Journal of Research and Practice (0.03), International Journal of Educational Development (0.02), Education Science – Theory and Practice (0.02) and Higher Education (0.02).

Based on this pre-selection of journals, we searched the reviews for our umbrella review.

Identification of articles for inclusion

We included all studies in the nine identified journals with review in the title and used similar criteria as in the journal identification process (Table 6).

Table 6: Criteria used to select documents

Criteria	Inclusion	Exclusion
Database source	Scopus and Web of Science	ERIC etc.
Specific source	9 journals	Books etc.
Document type	Articles and reviews	Editorials etc.
Publication period	Between 2014 and 2019	Before 2014 and after 2019
Language	English	Other languages
Subject area (Scopus)/ category (WoS)	Social sciences/ education & educational research	Other subject areas/ categories

A total of 21 studies (date of last search: Jan 15, 2020) were identified in the search: JVET (7), IJEVG (3), ERVET (2), IJRVET (2), JEW (2), ROCE (2), VL (2) and JTET (1). No article containing review in the title was published in IJTR between 2014 and 2019.

5.2.3 Eligibility

Following the title and abstract screening, two articles were excluded (Christie, 2017; Spours et al., 2019) because their purpose was not a review of research. They both reviewed practice. After reading the full text, six further review studies were excluded (Avis, 2018; Emmenegger et al., 2019; Guilbert et al., 2016; Little, 2015; McGrath et al., 2019; Small et al., 2018). These review studies were within the scope (literature review), but important methodological details (e.g. the criteria for the inclusion of studies) were not given. These reviews were not

eligible for this umbrella review (see section 2.1.2 Systematic and subjective syntheses). The flow chart (Figure 5), presents an overview of the search (identification) and eligibility steps (screening and check).
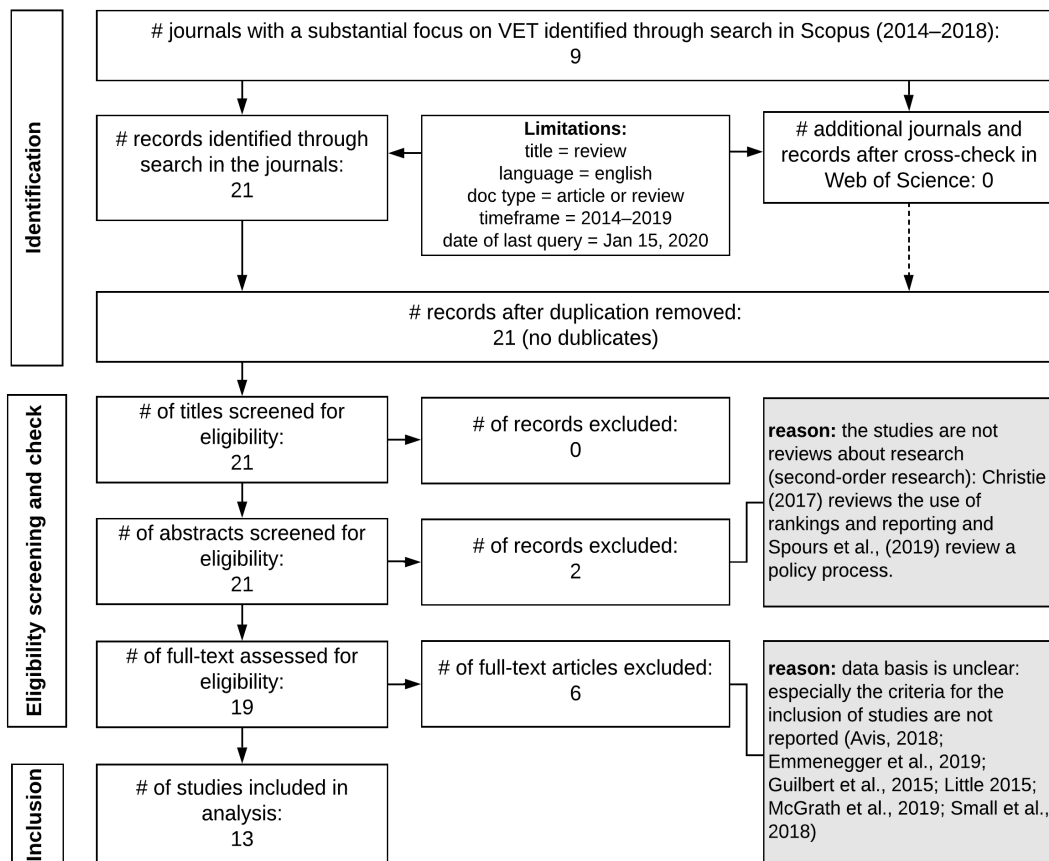

Identification			
# journals with a substantial focus on VET identified through search in Scopus (2014–2018): 9			
# records identified through search in the journals: 21	**Limitations:** title = review language = english doc type = article or review timeframe = 2014–2019 date of last query = Jan 15, 2020	# additional journals and records after cross-check in Web of Science: 0	
# records after duplication removed: 21 (no dublicates)			

Eligibility screening and check

# of titles screened for eligibility: 21 → # of records excluded: 0

# of abstracts screened for eligibility: 21 → # of records excluded: 2

reason: the studies are not reviews about research (second-order research): Christie (2017) reviews the use of rankings and reporting and Spours et al., (2019) review a policy process.

# of full-text assessed for eligibility: 19 → # of full-text articles excluded: 6

reason: data basis is unclear: especially the criteria for the inclusion of studies are not reported (Avis, 2018; Emmenegger et al., 2019; Guilbert et al., 2015; Little 2015; McGrath et al., 2019; Small et al., 2018)

Inclusion

# of studies included in analysis: 13

Figure 5: Flow of information through the different steps

In the observation period (2014 to 2019), the nine identified journals with a substantial focus on VET published a total of 1,283 articles, of which only 13 reviews (1.01% of the articles) dealt with a systematic interpretation, clarification or aggregation of previous research. The included 13 reviews are presented in the overview in the appendix. Based on the review typology we developed, five of the 13 reviews were conceptual in nature, four were scoping reviews, three were evidence-oriented, and one was critical in nature. None of the reviews examined focused on meta-syntheses, research methods or meta-analyses. In total, this resulted in current review gaps with respect to theory generation (meta-synthesis), practice

of theory elaboration and testing (methodological review) and the determination of overall effects across single studies (meta-analysis).

After identifying the corpus for our umbrella review, we continued with the appraisal, analysis and synthesis.

5.3   Data processing

5.3.1 Appraisal

Critical appraisal tools are available for many kinds of research studies, such as analytical cross-sectional studies, case control studies, case reports, case series, diagnostic test accuracy studies, economic evaluations, prevalence studies, qualitative research, quasi-experimental studies, randomized controlled trials, systematic reviews, text and opinion studies[6]. We used criteria from an appraisal checklist developed for umbrella reviews (Aromataris et al., 2015), which were also included in our overall methodological framework (Table 4). Each criterion was assessed using the following codes:

●= yes

◉= partly

○= no

Table 7: Appraisal checklist and results

Items	1	2	3	4	5	6	7	8	9	10	11	12	13
Research problem is clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●
Research objectives are clearly reported	●	●	●	●	●	●	◉	●	●	◉	●	●	●
The selected sources (e.g. databases) are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●
Reasons why studies have been included are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●
Method(s) of data extraction from reports is clearly reported and reasoned	●	●	●	●	●	◉	●	●	●	●	●	●	●
Method(s) of synthesizing the analysis results is clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●

We defined in advance that only studies that at least partially meet all appraisal criteria will be considered. The evaluation was made by the two authors separately, and the individual results

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6 https://joannabriggs.org/ebp/critical_appraisal_tools

were later discussed and agreed. The result of our appraisal is shown in Table 7. All 13 studies met this minimum requirement.

Exclusion

No studies were excluded in this step.

5.3.2 Analysis

Data extraction

A data extraction form was developed beforehand, based on the framework to assess the methodology of literature reviews (Table 4), to guide the data extraction.

Analysis

In the first step, we extracted, independently of each other, the data from one study using our data extraction form and discussed our results, understanding of the criteria and whether our data extraction approach was consistent with the research question and purpose. We clarified our criteria, adapted the form and extracted the data from the remaining twelve studies. Each criterion was assessed using the following codes:

● = criterion clearly reported (replication is possible)

◉ = criterion partly reported (replication is partly possible)

○ = criterion not reported or unclearly reported (replication is not possible)

Critical evaluation

The analysis was an iterative process in which we extracted data and updated the data extraction form. After this step, we discussed our emerging results until we reached a common agreement. This step-by-step approach was done to make the criteria consistent and obtain a common understanding of the extracted data (Levac et al., 2010).

5.3.3 Synthesis

We summarized the results (Σ^1) for each criterion and used this coding for the single ratings: ●=2, ◉=1, ○=0. For each line, we calculated the sum and summed up an overall rating with these codings: 26 (= 100%) = clearly reported =●, 13–25 (≥50%) = mostly clearly reported =◉, 0–12 (< 50%) = mostly unclearly reported =○. We also summarized the results for each study and used the same coding (●= 2, ◉= 1, ○= 0). For each column, we therefore calcu-

lated the sum and summed up an overall rating (Σ^2) with the same categories (100%, $\geq$50%, < 50%).

Based on our research question (Which methodological details are explicitly provided in literature reviews published in peer-reviewed journals with a substantial VET focus, and which ones are not?), we arrived at three perspectives on the methodological details. (1) Each study was analysed using the 25 criteria of the methodological framework (Table 4). (2) A cross-study assessment was carried out for each criterion. (3) We used the four process steps of a review (scope definition, data selection, data processing, data reporting) to create a summative evaluation for each. The results are presented in the following section.

Re-analysis

Methods of re-analysis were not applied.

5.4   Data reporting

5.4.1 Overview

Based on our typology (Table 3, Figure 4), we identified five conceptual reviews, four scoping reviews, three evidence reviews and one critical review (see appendix). A first conclusion is that there were four review types among the thirteen reviews (conceptual, scoping, evidence and critical). While this shows good breadth, the absence of three review types is problematic: (1) a meta-synthesis "involves analyses and theory generating syntheses" (Bondas & Hall, 2007, p. 115). None of the studies examined was aimed at theory generation. (2) Of the studies examined, none explicitly and exclusively focused on methods. As a sub-category or sub-question, research methods were partially considered (e.g. Schwendimann et al., 2018), but issues relating to research methods were not principally addressed, thus highlighting an important research gap. (3) None of the studies examined were meta-analyses, even though two scoping reviews did at least veer in this direction (Caves et al., 2019; Tonhäuser & Büker, 2016). The purpose of meta-analyses, i.e. the combination of "the results of quantitative studies to provide a more precise effect of the results" (Grant & Booth, 2009, p. 94), was not intended in any review. This results in three major review gaps in terms of theory generation, the review of methodology and methods used and the consolidation of empirical results.

The table in the appendix shows substantial differences between the reviews. (1) In eight reviews, a reference provided information about the review method used by the authors, while in five reviews, no such reference was given. (2) Eleven reviews mentioned the period under study, while two reviews provided no such reference. (3) In seven reviews, the included and excluded languages were mentioned. Out of these seven reviews three reviews had

a focus on multiple languages (not only English). In six reviews, no information was given. However, it can be assumed that languages other than English were not included in the reviews that did not indicate the language used. Finally, the problem of language exclusion was only addressed and reflected on in the review of Schwendimann et al. (2018). Language restrictions can create a systematic selection bias. (4) Many authors (6 of 13) provided no references regarding the basis of the data analysis and synthesis.

5.4.2 Findings

The results of the categories research problem and research question are shown in Table 8.

Table 8: Scope definition

Elements	Items	1	2	3	4	5	6	7	8	9	10	11	12	13	Σ^1
Research problem	Research problem is clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Research problem is embedded in the context of what is already known	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Research question	Objectives are clearly reported	●	●	●	●	●	●	◉	●	●	◉	●	●	●	◉
	Research questions are clearly reported	●	●	◉	●	●	●	◉	●	●	●	●	◉	●	◉
Σ^2		●	●	◉	●	●	●	◉	●	●	◉	●	◉	●	◉

A close examination of the reviews showed that their scope was mostly clearly presented (9 clear, 4 partly clear).

The results of the categories sources, search and eligibility are shown in Table 9.

Table 9: Data selection

Elements	Items	1	2	3	4	5	6	7	8	9	10	11	12	13	Σ^1
Sources	The selected sources (e.g. databases) are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	The source selection is reasoned	●	●	●	●	●	●	●	●	○	○	●	●	●	◉
Search	The search terms are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	The limitations are clearly reported[7]	●	●	◉	●	●	●	○	●	●	●	●	●	●	◉

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7 The criterion "language" was not considered. Information on how this criterion has been taken into account in the reviews is given in Annex 1.

Eligibility	The process of screening (title, abstract) and full text reading is clearly reported	●	●	●	◉	●	○	○	◉	●	●	●	●	○	◉
	Reasons why studies have been *included* are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Reasons why studies have been *excluded* are clearly reported	◉	◉	○	○	●	○	○	●	●	◉	●	●	○	◉
	A process overview (flow diagram) is given	○	○	○	○	●	○	○	●	○	●	○	○	○	○
Σ^2		◉	◉	◉	◉	●	◉	◉	◉	◉	◉	◉	◉	◉	◉

With regard to the process step *data selection*, only one article was complete in terms of our methodological framework. A helpful tool to create transparency in the selection process is the flow chart (see Figure 5). However, of the 13 studies examined, only 3 used this instrument. This is surprising, given that flow charts were recommended in Moher et al. (1999) and again in 2009 "to address the suboptimal reporting of meta-analyses" (Moher et al., 2009, p. 1006). We would like to extend this statement: flowcharts help in countering the suboptimal reporting of reviews.

The results of the categories appraisal, analysis and synthesis are shown in Table 10.

Table 10: Data processing

Elements	Items	1	2	3	4	5	6	7	8	9	10	11	12	13	Σ^1
Appraisal	Criteria, or checklist, used for the appraisal of the studies are clearly reported	●	●	◉	◉	●	◉	◉	●	◉	◉	○	●	◉	◉
	How the appraisal was done is clearly reported	●	●	●	○	●	○	○	●	●	●	○	●	◉	◉
	Excluded studies are clearly reported and reasoned	●	◉	○	○	●	○	○	●	●	●	●	●	○	◉
Analysis	Method(s) of data extraction from reports is clearly reported and reasoned	●	●	●	●	●	◉	●	●	●	●	●	●	●	◉
	Method(s) of analysis is clearly reported reasoned	●	●	◉	●	●	○	○	●	●	●	●	●	●	◉
	The result of the extraction and analysis is critically evaluated	●	●	◉	◉	●	◉	●	●	◉	●	●	●	●	◉

Synthesis	Method(s) of synthesizing the analysis results is clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Method(s) of re-analysis (if appropriate) of the synthesis results is clearly reported	●	○	○	○	○	○	○	○	○	●	○	○	○	○
	The relation between synthesis results and research question is clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Σ^2		●	◉	◉	◉	◉	○	◉	◉	◉	◉	◉	◉	◉	◉

With regard to the process step *data processing* one article (No 1) was complete in terms of our methodological framework. Because the process step *re-analysis* is not always appropriate, three further articles (No 5, 8 and 12) can be considered complete.

The results of the categories findings and conclusion are shown in Table 11.

Table 11: Data reporting

Elements	Items	1	2	3	4	5	6	7	8	9	10	11	12	13	Σ^1
Findings	Summarised findings are clearly reported	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Limitations of the study and findings are clearly reported	●	◉	●	○	●	◉	◉	●	●	●	◉	●	●	◉
Conclusion	A general interpretation of the results in the context of other studies is provided	●	●	●	●	●	◉	◉	●	●	●	●	●	●	◉
	Implications for future research are provided	●	●	◉	◉	●	●	●	●	●	●	●	◉	●	◉
Σ^2		●	◉	◉	◉	●	◉	◉	●	●	●	◉	◉	●	◉

Compared to the previous process categories *data selection* and *data processing*, the results of the process category *data reporting* are better.

6   Conclusions

Our study's results support four conclusions. (1) More systematic syntheses are needed due to a substantial quantitative gap in the review research. (2) In particular, review studies with a focus on meta-synthesis, research methods and meta-analysis are needed. (3) A literature review should be considered a valid research method and thus held to the same scientific rigour as other research methods. Reviews should therefore be based on a research method that includes transparent and reproducible procedures and verifiable or falsifiable findings. (4) In the studies examined, there was a high degree of heterogeneity with regard to the accuracy and completeness of the methodological steps and data. The developed methodological framework can serve as a guideline for conducting review studies in VET research.

Structures and reporting standards, especially in medicine, have been developed over time. However, it is problematic that "we don't have that in other areas, such as education, as we have in medicine. Until you have structure in place, you are going to continue with the question: What did you do?" (Wang, 2019, pp. 8–9). Following this discourse, we propose a clear distinction between *systematic syntheses* based on an explicitly described methodology of searching, selecting and synthesising the relevant body of knowledge with transparent and reproducible procedures and *subjective syntheses* (such as narrative and subjective reviews), which lack such methodology. While subjective syntheses are mainly based on presumptive conclusions, they can nevertheless form a basis for systematic syntheses. However, subjective syntheses often do not meet the scientific standards of transparency, reproducibility and verifiability/falsifiability. Systematic syntheses, in turn, can be distinguished according to their subject and purpose (Table 3).

This study is also subject to limitations. To date, no general standards for systematising and typologising reviews have been established. The presented conceptual framework could be therefore more differentiated (Booth et al., 2016a) or even less differentiated (Paré et al., 2015). However, a model should be distinctive, informative and applicable. We assume that the developed model is helpful for specifying the type of review used. The methodological framework could also include further items, e.g. the review has an accessible protocol (Moher et al., 2009), which will probably be the case in the future. Limitations are of course also included in our scope and search process, including that we have not included journals published in languages other than English and journals that are not indexed in the selected databases. This applies, for example, to the German VET journal *Zeitschrift für Berufs-und Wirtschaftspädagogik* (ZBW), which is not indexed in either SCOPUS or WoS. The publication language is almost exclusively German. A search on 5 January 2020 in the journal ZBW via the database FIS Bildung (searched with the word *review* in the field FREITEXT, including the title, keywords, and abstract) showed that, between 2014 and 2019, 140 articles were published, of which only 1 (Kayser & Ziegler, 2014) was referred to as a literature review. In quantitative terms, the results are comparably unsatisfactory.

Appendix

Included reviews

No	Author(s)	Title	Referenced review method	Period covered	Languages included	Sources	Studies included	Referenced analysis method	Review type
1	Caves, Baumann, & Renold (2019)	Getting there from here: A literature review on vocational education and training reform implementation	Jesson, Matheson, & Lacey (2011)	1984-2017	English	13 databases	177	Contrastive coding based on a conceptual framework. Subsample analyses with multivariate statistical methods. Several references provided.	Scoping review
2	Hökkä, Vähäsantanen, & Paloniemi (2019)	Emotions in learning at work: A literature review	No references provided	2000–2017	No information provided	2 databases	31	Thematic analysis (Attride-Stirling, 2001; Braun & Clarke, 2006)	Conceptual review
3	Haug, Plant, Valdimarsdóttir, Bergmo-Prvulovic, Vuorinen, Lovén, & Vilhjálmsdóttir (2019).	Nordic research on educational and vocational guidance: A systematic literature review of thematic features between 2003 and 2016.	Creswell (2013); Hughes, Mann, Barnes, Baldauf, & McKeown (2016)	2003–2016	Danish, English, Finnish, Icelandic, Norwegian, Swedish	5 databases	290	Systematization based on thematic areas, stated intentions in the studies, specific target groups, and additional thematic synthesis of preliminary conclusions (Creswell, 2013)	Scoping review
4	Chinedu, Wan Mohamed, & Ajah (2018)	A systematic review on education for sustainable development: Enhancing TVE teacher training programme	Petticrew & Roberts (2008); Pickering & Byrne (2014)	No information provided; probably unlimited	No information provided	4 databases	19	Thematic analysis and synthesis. No references provided.	Evidence review

5	Schwendimann, De Wever, & Cattaneo (2018)	The state-of-the-art of collaborative technologies for initial vocational education: A systematic literature review	Kitchenham & Charters (2007); Aveyard (2010)	No information provided; probably unlimited	English	8 databases	26	Descriptive statistic and thematic analysis (Braun & Clarke, 2006)	Scoping review
6	Cameron, Stuart, & Bell (2017)	Race based inequalities for Indigenous Australians' participation and engagement in VET: A targeted review of the research.	No references provided	journals: not reported; projects: 2000–2017; database: 1998–2016	No information provided; probably English	3 journals + research projects + 1 database	8 journal articles; 11 projects; 11; 56 "grey" publications	Content analysis and thematic analysis. No references provided.	Critical review
7	Middleton & Middleton (2017)	Review of literature on the career transitions of performing artists pursuing career development	No references provided	1980–2015	No information provided	3 journals + 1 database + 1 portal[8]	No information provided	Thematic analysis and synthesis. No references provided.	Conceptual review
8	Cerda-Navarro, Sureda-Negre, & Comas-Forgas (2017)	Recommendations for confronting vocational education dropout: A literature review.	Fink (2005); Petticrew & Roberts (2006); Littell, Corcoran & Pillai (2008)	published before 2014	English, French, and Spanish	22 databases	60	Inductive formation of categories (Taylor & Bogdan, 1987)	Evidence review
9	Mikkonen, Pylväs, Rintala, Nokelainen, & Postareff (2017)	Guiding workplace learning in vocational education and training: A literature review	Grant & Booth (2009)	1995–2015	English	2 databases	18	Data extraction matrix. No references provided.	Evidence review

8 Scholars Portal is a digital repository of journals, scholarly articles and books offered by the Ontario Council of University Libraries.

10	Zlatanovic, Havnes, & Mausethagen (2017)	A research review of nurse teachers' competencies	Gough, Thomas & Oliver (2012b)	2000–2016	English, Danish, Swedish & Norwegian languages	7 databases	25	Thematic synthesis (Oliver & Sutcliffe, 2012)	Conceptual review
11	Tonhäuser & Büker (2016)	Determinants of transfer of training: A comprehensive literature review	Webster & Watson (2002)	1990–2015	No information provided	3 databases	79	Dimensional systematization of quantitative studies based on a theoretical framework model. Several references provided.	Scoping review
12	Williams, Dodd, Steele, & Randall (2016)	A systematic review of current understandings of employability	No references provided	1960–2014	English	10 databases	16	Data extraction sheet and content analysis. No references provided.	Conceptual review
13	Crossman, & Cameron (2014)	A comparative thematic review of vocational leadership literature from the USA, Great Britain and Australia. Research in post-compulsory education	No references provided	2000–2013	No information provided; probably English	7 journals from one database, conference papers from AVETRA[9], reports from NCVER[10]	number of identified articles after search: 224, number of included articles: unclear (but less than 224); 11 conference papers / reports	Thematic synthesis. No references provided.	Conceptual review

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9 Australian Vocational Education and Training Research Association
10 National Centre for Vocational Education Research

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