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## Developing a terminology agreement in vocational education research: content validation of standard keyword indexes

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### ABSTRACT

The study conducted an expert-based content validation to develop and validate a standardized keyword index for vocational education research. A lack of standard terminology in vocational education leads to problems in literature discovery, conducting systematic reviews, and international collaboration. Five content experts (three professors and two doctorate holders) with a minimum of 10 years of experience in vocational education using purposive sampling strategy, evaluated 79 keywords that were extracted from a systematic literature review of recent publications (2014-2025). The experts assessed each keyword for relevance on a 4-point Likert scale. The study used the Content Validity Index (CVI) method for the data analysis at both the item level (I-CVI) and the scale level (S-CVI). The result showed that the content validity was outstanding with the S-CVI/Ave of 0.916 which was higher than the recommended limit of 0.90. The 79 keywords were able to achieve I-CVI scores of at least 0.80, with 46 of the keywords (58.2%) getting perfect agreement (I-CVI = 1.00) and 33 of the keywords (41.8%) I-CVI = 0.80. The validated keywords were categorized into eight thematic categories: Core VET Systems & Models, Pedagogical Approaches, Technical & Occupational Skills, 21st Century & Soft Skills, Industry 4.0 & Emerging Technologies, Policy Standards & Quality Assurance, Labor Market & Economic Development, and Sustainability & Contemporary Issues. This standardized index remedies the problem of terminological inconsistency in vocational education research and thus leads to more efficient literature retrieval, knowledge synthesis, and international research collaboration. The study offers a clear and repeatable framework for keyword standardization that can be used to guide future updates and changes in different educational contexts.



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### Introduction

Vocational education is very instrumental in workforce development and economic growth worldwide. It is mainly through vocational education that the skills gap between educational outcomes and labor market needs has been addressed (UNESCO, 2021; Wheelahan & Moodie, 2022). Such a sector of education that focuses on training people for particular trades or professions is, in fact, presently undergoing significant changes due to technological advancements, changing workforce needs, and policy reforms. Consequently, research in vocational education has been expanding dramatically across various disciplines and contexts (Cedefop, 2020;

Gessler et al., 2019). The growing number of studies has resulted in a huge volume of literature that uses different vocabularies, conceptual frameworks, and keyword systems to index and categorize the academic works. Still, the lack of a unified keyword index in vocational education research makes the synthesis of knowledge, systematic reviews, and evidence-based practices very challenging (Pilz et al., 2020). Because of inconsistent terminology, overlapping concepts, and discipline-specific jargon, researchers and practitioners often have a hard time finding relevant literature (McGrath et al., 2020). As an example, the terms "technical and vocational education and training (TVET)," "career and technical education (CTE)," "vocational education and training (VET)," and "professional education" are sometimes used interchangeably without awareness of the subtle differences that may exist among them which vary according to the geographical and institutional contexts (Billett, 2020; Gessler & Siemer, 2020).

Many obstacles to research are created by this lack of conformity in vocational education terminologies. It first makes it difficult for scholars to find and read one another's work since different keywords are used to describe the same or similar phenomena. As a result, the knowledge bases are fragmented, and there is a duplication of research efforts (Brolpito, 2018; Jossberger et al., 2018). Secondly, the inconsistent use of terms makes it difficult for researchers to determine the exact scope of the literature. "Moreover, the absence of commonly understood terms hampers interdisciplinary work as well as international collaboration and the sharing of knowledge, most noticeably, between English-speaking and non-English-speaking research communities (Zhao & Ko, 2018). Recent bibliometric studies of vocational education research have confirmed this terminological heterogeneity. In one of their studies, investigated how publications in comparative and international education journals were patterned and uncovered a great deal of inconsistency in the way vocational education research was indexed and classified." "Also, Li and Pilz (2022) performed a study on the jargon used in technical and vocational education and training (TVET) literature services. They found out that there were more than 200 different keywords that were used to denote the main concepts of the field with a considerable level of overlap and duplication." "The above findings clearly highlight the need to establish a standard way of indexing keywords in vocational education research."

Several disciplines, including education and social science, have seen efforts to standardize terminology and develop controlled vocabularies succeed. Alphabetically sorted taxonomies that ease systematic reviews and research syntheses have been set up in medical education by the Medical Education Research Study Quality Instrument (MERSQI) and the Best Evidence Medical Education (BEME) Collaboration (Gordon & Gibbs, 2014; Reed et al., 2021). In higher education research, the Higher Education Classification of Learning Outcomes (HECLO) offers a structured framework to classify learning outcomes across different contexts of institutions (Zlatkin-Troitschanskaia et al., 2016). A standardized keyword index was created through expert consensus by Romero-Rodríguez et al. (2020) in educational technology which helped in enhancing the efficiency of search and literature retrieval. Likewise, Hallinger and Kovačević (2021) used bibliometric mapping to find clusters of core terminology in educational leadership research which can be used for more uniform indexing solutions. These samples represent the possibility and worth of content expert validation of the standard keyword system development. In the area of vocational education, there have been several initiatives that have made efforts to solve the challenge of terminology. European Centre for the Development of Vocational Training (Cedefop) has a multilingual terminology database for vocational education and training which is mainly a European focussed one (Cedefop, 2020). A thesaurus for technical and vocational education has been prepared by UNESCO-UNEVOC, but it has not been very widely used so far even for the indexing of academic research (UNESCO-UNEVOC, 2019). The International Labour Organization (ILO) through the International Standard Classification of Occupations (ISCO-08) has standardized skills and occupation classifications quite extensively, thereby indirectly influencing the terminology of vocational education (ILO, 2022).

However, on the one hand, keyword systems that have so far been developed are still far from perfect. Firstly, such systems, by and large, have mainly reflected the concerns of a particular area or organization and have such a limited scope that they cannot be used for quite different international contexts (Gessler et al., 2019). Secondly, most of the taxonomies which currently exist are more oriented to policy and administrative division rather than to research indexing needs (McGrath et al., 2020). Thirdly, vocational education very quickly adapting itself to the challenges presented by Industry 4.0, digitalization, and sustainable development has led to the emergence of new areas of research that are still poorly covered by the existing keyword systems (Mourtzis et al., 2021; Siekmann & Fowler, 2017).

Recent scholarship has stressed the importance of adopting more inclusive and flexible terminology in vocational education that would be capable of covering new research areas such as work-integrated learning, micro-credentials, green skills, and artificial intelligence in vocational training (Choy et al., 2018; Ferns & Moore, 2022). Nonetheless, to the best of our knowledge, there is no thorough, expert-validated set of keywords available that would encompass the above-mentioned research topics while remaining consistent with the

established terminology. This study addresses a critical gap in vocational education research methodology by developing the first comprehensive, expert-validated standardized keyword index specifically designed for academic research indexing and retrieval. While previous efforts have focused on policy frameworks, multilingual databases, or regional classification systems, this study uniquely combines systematic literature analysis with expert-based content validation to create a research-oriented keyword index that reflects current scholarship while maintaining international applicability.

The novelty of this study lies in several key aspects. First, it employs a rigorous content validation methodology involving a panel of international experts with diverse backgrounds in vocational education research and practice, ensuring both theoretical rigor and practical relevance (Polit & Beck, 2006; Rubio et al., 2003). Second, it synthesizes contemporary research terminology from the past decade (2014-2024), capturing emerging themes such as digitalization, sustainability, and competency-based education that are inadequately represented in existing systems (Frey & Osborne, 2017; Loogma et al., 2019). Third, it provides quantitative evidence of content validity through the Content Validity Index (CVI), establishing a transparent and replicable standard for keyword inclusion (Davis, 1992; Yusoff, 2019). Furthermore, this study contributes methodologically by demonstrating the application of health sciences validation frameworks to educational research instrument development, an approach that has been underutilized in vocational education scholarship (Haynes et al., 1995; Lynn, 1986). By establishing clear criteria for keyword relevance and clarity, this research provides a model for future efforts to standardize terminology in related educational domains.

Developing a standardized keyword index has a great impact on deepening vocational education research. A standardized keyword index will be a good help for researchers when they are searching the literature, making systematic reviews, and finding relevant papers in different databases (Petticrew & Roberts, 2006). Journal editors and publishers will get it as a uniformed manuscript indexing scheme and it may raise article visibility and citation rates (Moed, 2017). Policymakers and practitioners will be able to get research evidence more effectively through this for program development and policy decisions (Pilz et al., 2020). This study also facilitates the professionalization of vocational education research as it sets methodological standards that can be compared to those in more established research areas (Gessler & Siemer, 2020). Giving the field a standardized keyword index is one way of forming an identity of vocational education as a unique research area, at the same time facilitating interdisciplinary communication with related fields such as educational psychology, labor economics, and organizational learning (Billett, 2020). In short, this paper is about designing and confirming a standardized keyword index for Vocational education research by means of expert content validation. To begin with, we identified and grouped systematically the keywords found in the latest Vocational education research literature. Next, we sought to verify the content validity of the suggested keywords by means of a panel of experts. We also aimed at setting quantitative validity criteria (I-CVI and S-CVI) for word inclusion. Moreover, the keyword index was updated, through expert input and the validation outcome. Finally, we give suggestions on how to use the standardized keyword index in research databases and publication practices.

## Method

### Research Design

This study used a content validation method to create and validate a standardized keyword index for vocational education research. Content validation refers to a carefully planned series of steps that are used to evaluate how well a measurement tool actually measures the construct that it is designed to measure (Polit & Beck, 2006; Yusoff, 2019). It is especially a suitable method for developing taxonomies and classification systems in the field of educational research because it utilizes the agreement of experts through the identification of a comprehensive and relevant set of constructs (Lynn, 1986; Zamanzadeh et al., 2015).

### Expert Panel Selection

Through purposive sampling strategy, five content experts in vocational education were invited to participate. The panel included members who are three professors and two doctorate holders, all of them have specialty in vocational education. The number of experts on the panel conforms to the suggestions of methodological researchers that 3-10 experts can suffice for content validation especially when experts have high levels of expertise (Lynn, 1986; Polit et al., 2007).

Experts were chosen on the basis of the following inclusion requirements: (a) current status as academics or practitioners in vocational education; (b) a minimum of 10 years of professional experience in vocational education research, teaching, or practice; and (c) a substantial scholarly contribution through peer-reviewed publications, conference presentations, or professional recognition in the field of vocational education (Grant & Davis, 1997; Rubio et al., 2003). The employed criteria guaranteed that the panel members had both sufficient theoretical knowledge and practical experience to assess the relevance and comprehensiveness of the suggested keyword index.

### Instrument Development

At first, the main set of keywords came from a review of several research articles on vocational education, published in the leading databases like ERIC, Scopus, and Web of Science, during the last ten years (2014-2024). Keywords were picked out, categorized by themes, and laid out in the form of a draft taxonomy. The whole procedure was in line with the methods employed in creating educational classification systems (Becker & Oxman, 2008; Rodrigues et al., 2017).

### Data Collection Procedure

Validation packages were sent to each expert, which included: (a) a brief description of the study objectives; (b) the proposed keyword index with operational definitions; (c) a content validation form; and (d) a letter with evaluation instructions. Experts had to rate each keyword according to two dimensions: relevance and clarity, based on a 4-point Likert scale (1 = not relevant/clear, 2 = somewhat relevant/clear, 3 = quite relevant/clear, 4 = highly relevant/clear) (Polit et al., 2007). Moreover, experts commented on missing keywords, redundancies, or changes that had to be made, etc., in the qualitative part of the feedback. Data collection was performed during a period of four weeks in order to give experts enough time to carry out a detailed evaluation. When it was necessary, follow-up contacts were made in order to clarify expert feedback and confirm it was complete.

### Data Analysis

Quantitative analysis was done by determining the Content Validity Index (CVI) at the item level (I-CVI) and scale level (S-CVI). The I-CVI was determined as the fraction of experts marking each keyword as 3 or 4 on the relevance scale (Polit & Beck, 2006). The keywords that had an I-CVI  $\geq 0.80$  were kept, which is in line with the generally accepted levels of content validity (Davis, 1992; Polit et al., 2007). The S-CVI was determined by the average method (S-CVI/Ave), where values  $\geq 0.90$  indicated excellent content validity (Polit & Beck, 2006). The qualitative feedback of the experts was evaluated using a thematic content analysis to recognize the changes proposed, additions, and deletions in the text (Elo & Kyngäs, 2008). This helped to make changes to the keyword index structure and content several times.

## Results and Discussions

### Results

#### Descriptive Statistics of Expert Validation

The expert panel evaluated 79 keywords proposed for the standardized vocational education keyword index. Table 1 shows the demographic characteristics of the expert panel, and Table 2 provides a summary of the overall validation results.

**Table 1.** Expert Panel Characteristics

Expert	Academic Rank	Years of Experience	Field of Expertise
Expert 1	Professor	15+ years	Vocational Education Research
Expert 2	Professor	12+ years	Technical and Vocational Education
Expert 3	Professor	18+ years	Curriculum Development in VET
Expert 4	Doctor	10+ years	Vocational Pedagogy
Expert 5	Doctor	11+ years	Industry-Education Linkages

#### Content Validity Analysis Item-Level Content Validity Index (I-CVI)

Each keyword was given an I-CVI through experts dividing the number who rated the keyword as relevant (score = 1) by the total number of experts ( $n = 5$ ). As a result of the suggestion by Polit and Beck (2006), words with I-CVI  $\geq 0.80$  were judged to have excellent content validity and thus, were kept and unchanged.

**Table 2.** Content Validity Results by Keyword Category

Validation Category	Number of Keywords	Percentage	I-CVI Range
Accepted (I-CVI = 1.00)	46	58.2%	1.00
Accepted with revision (I-CVI = 0.80)	33	41.8%	0.80
Rejected (I-CVI < 0.80)	0	0.0%	-
Total	79	100%	0.80-1.00

All 79 keywords achieved I-CVI scores of either 0.80 or 1.00, suggesting that all the keywords were viable enough for content validity at a minimum level (Davis, 1992; Polit et al., 2007). To be more precise, 46 keywords

(58.2%) were agreed upon totally by the experts (I-CVI = 1.00), whereas 33 keywords (41.8%) achieved I-CVI = 0.80 with four of the five experts rating them as relevant.

**Keywords with Perfect Agreement (I-CVI=1.00).**

Table 3 lists the 46 keywords that were unanimously endorsed by the experts, grouped into thematic categories. The main ideas in vocational education embedded in these keywords are those which different international and national contexts recognize as the same concept quite broadly. The proof for this is the unanimous agreement of the experts.

**Table 3.** Keywords with Perfect Expert Agreement (I-CVI = 1.00)

Thematic Category	Keywords
Core Terminology	VET Vocational education; Technical and vocational education (TVET); Vocational training; Career and technical education (CTE); Occupational education; Dual system education; Apprenticeship programs; Internship models
Learning Approaches	Work-based learning; Competency-based curriculum; Industry-based curriculum; Experiential learning; Project-based learning (PBL) in TVET; Skills-oriented learning; Problem-solving skills
Industry 4.0 Technology	& Industrial automation skills; Mechatronics; Digital TVET; Industry 4.0 skills; Smart manufacturing training; Automation and robotics education; Digital literacy for vocational learners
Specific Vocational Skills	Teaching factory; Technical skills training; Manufacturing skills; Welding technology; Automotive technology; Electrical installation; Construction technology; Hospitality and tourism skills; Culinary arts training; Health vocational skills; Employability skills; Work ethics; Professional communication skills
21st Century Competencies	Teamwork and collaboration; Workplace adaptability; Industry partnership; Workplace collaboration
Policy & Standards	Competency assessment; Occupational standards; Skill qualification frameworks (NQF, KKNI); Labor market alignment; Vocational-industry linkage
Sustainability Development	& Skills for sustainable development; SDG 4 quality vocational education; SDG 8 decent work skills; Technical skills for green transition; TVET for economic growth
Indonesian Context	Pendidikan vokasi berbasis industri; SMK (Sekolah Menengah Kejuruan); Vokasi perguruan tinggi; Teaching factory SMK; Program D3 dan D4; Rekognisi pembelajaran lampau (RPL); Link and Match IHE; Kemitaan SMK-DUDI; Kurikulum Merdeka Vokasi; Lembaga Sertifikasi Profesi (LSP); Kompetensi keahlian SMK

**Keywords Needing Minor Consideration (I-CVI = 0.80)**

Thirty-three keywords secured an I-CVI of 0.80, which means a high but not complete agreement among experts. The keywords that were thematically categorized in Table 4 represent these words.

**Table 4.** Keywords with Strong Agreement (I-CVI = 0.80)

Thematic Category	Keywords (I-CVI = 0.80)
Educational Approaches	Technical education; Workforce education; Skills development; Competency-based education; Vocational pedagogies
Specialized Skills Areas	Industry certification; Virtual reality in TVET; Simulation-based vocational training; EdTech for vocational learning; AR/VR-based competency assessment; Vocational education reform; Skills mismatch; Youth unemployment; Workforce development policy; Labor market integration; Skills gap analysis; Productivity enhancement; Green skills for sustainability

The single dissenting vote (score = 0) for these keywords came from Expert 3 in 30 cases, Expert 4 in 2 cases (Vocational training, Digital TVET), and Expert 5 in 1 case (Workforce education). Upon qualitative review of expert feedback, the dissenting opinions primarily related to concerns about: 1) Terminological overlap: Some experts noted potential redundancy between certain keywords (e.g., "Technical education" vs. "Vocational education") 2) Contextual specificity: Questions about whether certain emerging technology terms (e.g., "Virtual reality in TVET") should be retained as standalone keywords or subsumed under broader categories 3) Regional terminology preferences: Variations in how certain terms are understood across different educational systems

Despite these concerns, all keywords with I-CVI = 0.80 were retained based on the established validity threshold and supporting evidence from the literature review.

### Scale-Level Content Validity Index (S-CVI)

The overall S-CVI/Ave (average method) was determined by the sum of all I-CVI scores divided by the total number of keywords:  $S-CVI/Ave = (46 \times 1.00 + 33 \times 0.80) / 79 = 0.916$ . This S-CVI/Ave score of 0.916 is above the recommended limit of 0.90 for content validity at an excellent level (Polit & Beck, 2006), hence the keyword index as a whole has a high level of content validity.

### Inter-Expert Agreement Analysis

Table 5 presents the distribution of expert ratings across all 79 keywords. The overall agreement rate for all expert-keyword combinations was 92.2% (364 out of 395 possible ratings). Experts 1, 2, and 4 confirmed the relevance of all the 79 keywords, while Expert 5 confirmed 78 keywords (98.7%). Expert 3 showed more selective agreement with the experts and only 49 keywords (62.0%) were rated as relevant by him/her.

**Table 5.** Distribution of Expert Ratings

Expert	Number of "Relevant" Ratings (Score = 1)	Percentage	Number of "Not Relevant" Ratings (Score = 0)	Percentage
Expert 1	79	100%	0	0%
Expert 2	79	100%	0	0%
Expert 3	49	62.0%	30	38.0%
Expert 4	79	100%	0	0%
Expert 5	78	98.7%	1	1.3%
Total	364/395	92.2%	31/395	7.8%

### Theme Based Classification of the Validated Keyword Index

After expert validation and thematic analysis of the keywords, the final uniform keyword index was divided into eight major categories. The categories and subcategories provide a system of logic for dividing and organizing research articles on vocational education. At the same time, the framework is not rigid and allows individual keywords to be applied across categories.

**Table 6.** Final Keyword Index Structure by Thematic Categories

Category	Number of Keywords	Examples
Core VET Systems & Models	12	TVET, Dual system education, Apprenticeship programs
Pedagogical Approaches	11	Competency-based education, Work-based learning, Teaching factory
Technical & Occupational Skills	18	Manufacturing skills, Mechatronics, Construction technology
21st Century & Soft Skills	8	Problem-solving skills, Digital literacy, Teamwork and collaboration
Industry 4.0 & Emerging Technologies	9	Industry 4.0 skills, AR/VR-based assessment, Smart manufacturing
Policy, Standards & Quality Assurance	10	Occupational standards, NQF/KKNI, Industry certification
Labor Market & Economic Development	7	Skills gap analysis, Labor market alignment, Workforce development
Sustainability & Contemporary Issues	4	SDG 4, Green skills, Skills for sustainable development
Total	79	

## Discussion

### Interpretation of Validation Results

The results from the validation clearly show that the experts agree very much on the standardized keyword index for research in vocational education that has been proposed. The obtaining of S-CVI/Ave = 0.916 is a sign of a

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very good level of agreement on content validity overall, and it is above the limit set at 0.90 (Polit & Beck, 2006). This outcome implies that the keyword index thoroughly covers the area of vocational education research that is current and is suitable for the use in academic databases and in the publication convention.

### High Consensus Keywords

These 46 keywords which received perfect agreement ( $I-CVI = 1.00$ ) are the main foundation for the conceptual structure of the research on vocational education. These keywords are tightly related to the main constructs identified in the most recent systematic reviews and bibliometric analyses of the field (Li & Pilz, 2022). The unanimous endorsement of traditional terms such as "TVET," "apprenticeship programs," and "dual system education" reflects their persistent value in spite of changes in educational contexts, thus, support the findings of Gessler and Siemer (2020) for whom the established VET models are of continuing importance.

Along with this, perfectly agreed contemporary keywords referring to Industry 4.0 and digital transformation include also "industrial automation skills," "digital literacy for vocational learners," and "smart manufacturing training." This trend shows the field's agreement with the idea that technological change is at the center of vocational education research, which is in line with Mourtzis et al. (2021) and Frey and Osborne's (2017) studies on the effect of automation on workforce development. The panel in their agreement gives the green light to these new words as a part of a standardized index which is aimed at researchers of the next decade.

The presence of sustainability-related keywords that scored perfect agreement, such as "SDG 4 quality vocational education," "SDG 8 decent work skills," and "technical skills for green transition," mirrors the global development priorities and TVET's role in sustainable development highlighted by UNESCO (UNESCO, 2021). This result is a step further in the follow-up of the work done by Cedefop (2020) and UNESCO-UNEVOC (2019) that put the spotlight on sustainability in the policy frameworks but had not confirmed these words for research indexing use.

### Keywords with Strong but Not Unanimous Agreement

The 33 keywords scoring  $I-CVI = 0.80$  have to be interpreted with caution. Even though these keywords are found to be valid according to the set criteria, the pattern of dissenting opinions mainly from Expert 3 suggests that choices of terms and limits of concepts are issues worth significant consideration. Expert 3's quite limited approval (62.0% acceptance rate) might represent the strict interpretative level of keyword distinctiveness and some concerns of possible redundancy in the index.

A number of keywords receiving  $I-CVI = 0.80$  are related to vocational education concepts that are newly introduced or redefined, e.g. "virtual reality in TVET," "AR/VR-based competency assessment," and "EdTech for vocational learning." The difference of opinion among the experts regarding these terms may be a sign of the debates that will continue on whether technology-specific keywords will still be relevant as technologies change or whether broader categorizations would be more durable. This dilemma between specificity and durability when developing keywords has been observed in the standardization processes of other fields (Hallinger & Kovačević, 2021; Romero-Rodríguez et al., 2020).

The dissenting votes on "skills gap analysis," "labor market integration," and "workforce development policy" may be pointing to a situation where the experts have different ideas of how to set the boundaries between vocational education research and other fields such as labor economics and public policy. The result in this study demonstrates that vocational education research is interdisciplinary in essence and further complicates the scholars' struggle in keeping very clear conceptual boundaries and at the same time allowing significant connections to related fields (Billett, 2020; McGrath et al., 2020).

### Contribution to Terminological Standardization

This research makes several significant contributions to solving the problem of terminological inconsistency in vocational education research. Firstly, it offers empirical evidence for selecting keywords through a methodical expert validation that contrasts with nowadays attempts that heavily rely on classifications based on administrative or policy-driven (Cedefop, 2020; UNESCO-UNEVOC, 2019). The quantitative validation approach that was sourced from health sciences research (Polit & Beck, 2006; Yusoff, 2019) sets a clear and transparent benchmark for keyword inclusion that is capable of being an inspiration for future revisions of the index.

Secondly, the approved keyword index effectively fills the gap in vocational education terminology between regional and linguistic differences. The presence of both internationally standardized terms (e.g., "TVET," "apprenticeship programs") and local Indonesian terms (e.g., "SMK," "Link and Match IHE," "Kurikulum Merdeka Vokasi") with high  $I-CVI$  scores proves that a universal index is capable of serving various educational contexts without losing conceptual clarity. This discovery is a response to the concerns of Zhao and Ko (2018)

about the predominance of English language terms in international research databases and it points to a model of inclusive, multilingual keyword development.

Thirdly, the arrangement of validated keywords into eight themes not only provides a hierarchical structure but also makes literature search from a broad perspective to a more targeted scale of specific research domain investigation more manageable. Such a categorization method is in line with the standardization works in educational leadership (Hallinger & Kovačević, 2021) and educational technology (Romero-Rodríguez et al., 2020), albeit, it was accomplished with vocational education's unique conceptual landscape in mind.

#### **Alignment with Contemporary Research Priorities**

The verified keyword list shows a strong match with current issues in vocational education that have been recently reviewed by scholars and discussed in policy documents. The high number of Industry 4.0-related keywords (11.4% of the total) shows that the field is aware of the technological transformation, which is in line with the suggestions of Siekmann and Fowler (2017) and Mourtzis et al. (2021), who recommend more research on the digitalization of vocational training.

Also, the adoption of competency-based educational methods, vocabulary related to work-integrated learning modalities, and keywords for 21st-century skills correspond to the debates about how vocational education can best deliver the skills needed by learners to face uncertain labor markets (Wheelahan & Moodie, 2022). The expert check of these terms reveals that there is still a strong agreement that competency frameworks and workplace learning are the mainstay of vocational education, despite the criticisms of somewhat narrow skills-focused approaches (Wheelahan & Moodie, 2022).

The presence of keywords on sustainability and sustainable development (5.1% of total keywords) indicates that the role of vocational education in climate change mitigation and green transition has been increasingly recognized (Cedefop, 2020). However, the modest ratio of sustainability-related keywords to technology-related ones may suggest that green skills and sustainable development in TVET are still new areas, hence, in need of further research, which is in line with the recent calls for expanded research in this domain (Pilz et al., 2020).

#### **Implications for Research Practice For Researchers**

There are a number of real benefits that the validated keyword index brings to the vocational education researchers. Initially, it serves as a manual for keyword selection when authors put together their manuscripts for publication, hence it may raise articles discoverability and citation counts. Studies in bibliometrics have revealed that the use of consistent, well-chosen keywords can greatly facilitate literature retrieval in database searches (Moed, 2017). Secondly, the index makes it easier for those who are conducting more thorough and systematic literature reviews to standardize their respective search tools using the same vocabulary across different databases. In short, it helps to overcome a traditional problem in vocational education systematic reviews, i.e., the use of inconsistent terminology results in the synthesis of incomplete evidence (Li & Pilz, 2022).

Besides, theoretically, organization of keywords by category enables researchers to locate their work more easily in the overall landscape of vocational education research, uncovering links with other research fields and the possibilities of interdisciplinary collaborations. This feature of the layout is a direct response to the requests of Gessler et al., (2019) for more conceptual/theoretical integration of the different research traditions fragmented in vocational education.

#### **For Journal Editors and Publishers**

Journal editors and publishers in the field of vocational education can take advantage of the validated keyword index as a tool to bring about uniformity in their manuscript indexing practices. This, in turn, would lead to enhanced consistency among various journals and easier cross-journal literature searches.

The index's dual focus on established and emerging terminology not only enhances the utility of the tool but also offers editors a conceptual map to assess if manuscript submissions align with the most recent research priorities in the discipline. This could become a valuable guide for editorial decisions regarding special issues, themed collections, and the overall strategic development of the journal.

#### **For Database Administrators and Information Specialists**

Putting into practice a standardized keyword index across major educational databases, such as ERIC, Scopus, and Web of Science, can greatly enhance vocational education literature's search precision and recall. Database managers could exploit these validated keywords to: (a) generate thesauri of controlled vocabularies for vocational education, (b) design mapping tables that connect author-supplied terms to standardized ones, and (c) set up faceted search functionalities that are consistent with the eight thematic categories identified in this study.

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Information specialists and librarians collaborating with vocational education researchers can use the keyword index in research consultation sessions to guide scholars in the development of more efficient search strategies and the quicker spotting of pertinent literature. This use of the keyword index is in line with the general move towards enhancing information literacy in educational research (Petticrew & Roberts, 2006).

### **Limitations and Considerations for Future Research**

Several limitations of this study deserve to be pointed out. Firstly, although the expert panel complied with the criteria for size and composition (Lynn, 1986; Polit et al., 2007), the five-member panel is still a very small fraction of the global vocational education research community.

Secondly, the difference between Expert 3's acceptance rate, which was substantially lower at 62.0% and those of the other experts (98.7-100%) raises the issue of possible measurement errors or the difference in how experts conceptualize the scope of vocational education research. At the same time, this variation is normal in content validation studies (Rubio et al., 2003). Future research, however, might be made more effective by a detailed qualitative exploration of the experts' decision-making processes, for example, through cognitive interviews or think-aloud protocols during the validation process.

Thirdly, the present study only looked at relevance ratings, with a 4-point scale being reduced to a binary accept/reject decision for I-CVI calculation. Future validation studies could incorporate additional dimensions such as clarity, specificity, and anticipated frequency of use, providing a more nuanced evaluation of each keyword's utility.

Fourth, the keyword index is a reflection of the vocational education research priorities at the time of 2024-2025. Due to the fast changes in technological and policy aspects of vocational education, the index will need to be periodically reviewed and updated to stay relevant. We propose that a systematic review cycle be put in place (e.g., every 3-5 years) to decide if new keywords need to be introduced, existing ones changed, or outdated ones deleted. This continuously evolving approach to keyword standardization has proven to be successful in medical education (Reed et al., 2021) and can be introduced in vocational education as well.

Fifth, although Indonesian-language keywords were incorporated in the study to address the local context, the index is still majorly English-language dominated. Future studies should investigate if the same kind of validation process in different linguistic and regional settings would result in similar keyword sets or if there would be a necessity for multiple complementary keyword indices with clear mapping relationships between them due to significant regional variations. Such multilingual development would be in line with UNESCO's objectives for inclusive, globally accessible research in technical and vocational education and training (UNESCO, 2021).

### **Theoretical Implications**

Besides their practical applications, these authors also argue that the work can bring theoretical knowledge to discussions in areas of knowledge organization and disciplinary identity within vocational education research. The keyword index that has been verified represents the most recent empirical grounding that can be used conceptually to delineate the field. Hence, it identifies those topics and methods which, according to the experts, can be considered central or peripheral areas of the field. This factual charting of the discipline's conceptual geography could be used as a background against which vocational education's interactions with general education, higher education, and workforce development can be discussed (Wheelahlan & Moodie, 2022).

The agreement among researchers on keywords that typify different theoretical traditions—from economics-oriented human capital theory terms such as "labor market alignment" on the one hand, to social justice-advocating terms such as "skills mismatch" and "decent work" on the other—reflects the presence of several theoretical perspectives in the field, some of which may be in conflict with each other. This pluralism might be seen as the field's intellectual strength rather than its fragmentation. It allows vocational education research to investigate complex issues from different analytical perspectives (Billett, 2020; McGrath et al., 2020).

The validated index's categorical structure with its eight thematic domains can be regarded as a tentative taxonomy of vocational education research which may be deepened and extended into a full conceptual framework. This framework could play the same roles as the MERSQI in medical education (Reed et al., 2021) or the HECLO in higher education (Zlatkin-Troitschanskaia et al., 2016), namely, it would offer a set of standardized categories that can be used in research syntheses and meta-analyses.

### **Recommendations for Implementation**

We have several recommendations for the implementation of the standardized keyword index based on validation results and discussion, (1) A phased implementation approach; (2) User guidance (3) Flexibility provisions; (4) Regular updates; (5) Cross-referencing (6) Training and support.

A phased implementation approach, start with major vocational education journals voluntarily adopting the index and increasing it to more databases as the index becomes familiar to the users. User guidance, besides the keywords, create other supporting materials such as keyword definitions, examples of usage, and decision trees that will enable writers to choose the right keywords from the index. Flexibility provisions, authors should be allowed to use extra keywords alongside the standardized ones to address highly specialized or emerging topics that are not sufficiently covered by the present index. Regular updates, the review committee should be responsible for regularly reviewing proposed additions or changes to the index at set intervals to ensure that it continues to be responsive to the changing research priorities. Cross-referencing, besides creating mapping tables that link the validated keywords to the related terms of other classification systems (e.g., Cedefop terminology, ISCO-08 occupational classifications), also ensure the facilitation of interdisciplinary research and policy connections. Training and support, it would be great to prepare online materials and workshops for the researchers, editors, and information specialists so that they can take full advantage of the standardized keyword index.

## Conclusions

This study has been able to develop and validate a standardized keyword index for vocational education research through expert content validation. The index contains 79 keywords ordered into eight thematic categories. With an overall S-CVI/Ave of 0.916, the index has shown excellent content validity and is a strong agreement of experts on the conceptual coverage of current vocational education scholarship. The validated index closes a major gap in the field by offering a standardized vocabulary for research indexing, literature searching, and knowledge synthesis. The use of this index can lead to better research discoverability, easier systematic reviews, and the identity of vocational education as a separate research field can be strengthened. Subsequent studies should concentrate on the global validation of the index, the investigation of its tangible impact on literature search efficiency, and continuous updating to maintain research priorities in vocational education.

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