Key skills in technical and vocational education & training system: A scoping review

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Abstract---Background: The role of technical and vocational education & training in providing educational opportunities for career advancement of young, providing skilled manpower, seizing entrepreneurial opportunities, and acquiring job skills has made this type of education a tool for sustainable development of countries. However, identifying key skills that should be provided to trainees is essential. Hence, this study aimed to identify key skills in the technical and vocational systems. Materials and Methods: This scoping review was performed following the Aksey & Omaly (2005) model. We systematically searched international databases of ERIC, PsycINFO, PubMed Central, OECD library, Web of Science, EMBASE, CINAHL, VOCED Plus, Google Scholar, and Scopus and national databases of SID and MagIran using the following keywords and their Persian equivalents: Technical and vocational education and training, TVET, Skill, Soft Skill, Hard Skills, and Competency. Results: The initial search yielded 287 articles, of which seven were found as eligible. Various key skills were categorized as general skills, job skills, problem-solving skills, etc. Conclusions: Learning key skills not only prepares individuals for their future job roles but also helps them to maintain their jobs and improve the quality of work, leading to sustainable, national growth. Hence, it should be embedded into the long-term goals of technical and vocational education & training systems worldwide.

Introduction

Education is any pre-designed activity or strategy aimed at training trainees [1-3]. It is a continuous process whose ultimate goal is to enhance people's abilities, merits, and competency to perform tasks and help them achieve personal development in an ever-changing world [4]. Along with transformation and changes in our lifestyle, the labor market trends also change at different times [5]. In this line, educational institutions, which are responsible for training individuals based on the dominant trends, play a key role in responding to trends in the labor market [6]. Globally, such institutions work in the form of technical and vocational education & training (TVET) [7].

According to the definition by UNESCO and the International Labor Organization (ILO), TVET refers to aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupants in various sectors of economic and social life [8].

The role of TVET in providing educational opportunities for the career advancement of youth, training skilled human resources [9], seizing entrepreneurial opportunities, and acquiring job skills has made this type of education a tool for the sustainable development of countries. However, such programs didn't attract sufficient attention in many countries, and there is no program to acquire the necessary skills to enter the labor market or available programs are inefficient [7]. So that 'the third International TVET Congress, Shanghai, China,' (2012) noted the lack of fair and widespread access of all society members to technical and vocational education, as well as the unrelated, unacceptable quality of TVETs, as major factors that affect the lack of skills-enhancing in individuals [11].

For years, there was a belief that the higher the knowledge and technical skills, the higher the progress opportunities. However, recent studies highlighted that non-technical skills also contribute to obtaining technical skills. These skills, known as soft skills, include teamwork, learning about learning, relationships, problem-solving, professional ethics, the use of new communication technologies, entrepreneurship, and resource management [12]. Therefore, training a combination of skills should be embedded in the TVET system of countries, particularly for the agenda of trainers of trainers. Formal TVETS do not meet expectations to equip individuals with necessary job skills, mainly because trained skills do not match the expectations of the labor market [13]. Hence, there is a need for a paradigm shift from TVET to technical and vocational skills development (TVSD). TVSD's paradigm shift seeks to combine technical skills and shared skills in all occupations that are essential for an individual's effective performance and enabling them to innovate and adapt to new learning environments and different sectors of the economy [14]. This effective shift can result in educational transformations by planning to achieve the best and most

essential skills for individuals. Nevertheless, the main question is 'what skills should be provided in the technical and vocational education & training system to ensure that participants have the highest efficiency in playing their future job roles?'

Methods

The current scoping review is performed following the Arksey & O'Malley model (2005) in six steps: (1) Specifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating and summarizing the findings, and (6) reporting the results [15].

(1) Specifying the research question

What key skills should be embedded in the technical and vocational training system?

(2) Identifying relevant studies

We systematically searched international databases of ERIC, PsycINFO, PubMed Central, OECD library, Web of Science, EMBASE, CINAHL, VOCED Plus, Google Scholar, and Scopus and national databases of SID and MagIran using the following keywords and their Persian equivalents: Technical and vocational education and training, TVET, Skill, Soft Skill, Hard Skills, and Competency. Inclusion and exclusion criteria are provided in Table 1.

(3) Study selection

The initial search yielded 287 articles, of which seven were found as eligible. Data organization was performed using EndNote, and duplicates were removed. Initially 287 articles were found, in which 93 were reviewed after removing duplicates. After initial screening, 69 articles were selected. Full-text of 66 related articles were found, of which 59 were removed due to focusing on the general education system and TVET and not providing a precise answer to the study questions. Eventually, the full-text of seven articles was evaluated. The present study was conducted based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyzers) recommendations (Figure 1).

(4) & (5)   Collating and summarizing the findings and collating and summarizing the findings

Information on eligible studies is discussed briefly in Table 2.

(6) Reporting the results

Key skills that are widely emphasized in most TVET systems, according to previous studies, are presented in Table 3 [16]. Selecting skills for TVET systems depends on the context and cultural, social, political, and economic status of countries and varies from one country to another. Skills emphasized by TVET systems of six selected countries are provided in Table 4 [17]. In the TVET system

of many countries, these key skills are called 'employment skills'. Employment skills are skills, knowledge, and attributes that will most likely help individuals maintain their jobs and find excellence. Globally, three sets of skills are found as employment skills [18]:

- General skills (problem solving, adaptability, professionalism, lifelong learning, teamwork, communication, communication and information technology and computer, organizational skills, leadership, personal organization and time management, targeting skills, self-awareness and self-learning);

- Main vocational skills (knowledge related to discipline and principles of education, lifelong learning, familiarity with latest problems, problem-solving and decision-making skills, technology); and

- Personal characteristics (competencies and positive attitudes).

In the UK, ensuring that the workforce is equipped with the right skills is essential to achieving sustainable growth and prosperity. The necessary skills are categorized into four to make a comprehensive set of skills, including employment skills, job skills, investment skills, and core skills [19].

As a rule, in today's world, with continuous advancement and use of technology, the skills and competencies needed to adopt technology are essential for employees. UNESCO lists three types of skills for effective use of ICT in TVET, as follows:

- Basic functional digital skills (enable an individual to access and engage with digital technologies);

- Generic digital skills (enable an individual to use digital technologies in meaningful and beneficial ways); and

- Higher-level skills (enable an individual to use digital technologies to empower and transform) [20].

In this study, to maintain scientific accuracy and validity of data, the accuracy of search strategy, targeted and accurate search in line with study objectives, the following measures were performed: comprehensive evaluation of articles, searching multiple databases, consulting with experts, appliance of a consultative strategy to ensure comprehensiveness of the search strategy, regular meetings to negotiate with the research team and achieving agreement, communication with the authors of studies in case of ambiguity or the need for receiving their advice, complete and accurate writing of the article, and accurate referencing.

Ethical Considerations

The research purpose and methodology of this study, which is a part of a Ph.D. thesis, were subjected to scrutiny by the Internal Research Ethics Committee of Shahid Beheshti University of Medical Sciences (Ethical Code:

IR.SBMU.SME.REC.1400.031). To observe ethical principles, while carefully investigating the identified articles and observance of scientific accuracy in maintaining the message of studies, high accuracy is made in citing references.

Discussion

The technical and vocational education & training (TVET) systems must have some factors and characteristics to be effective and efficient, which have been emphasized by several studies conducted by UNESCO and ILO . Most countries have focused on general education systems, while TVETs play a key role in the development of key skills of occupation. Developing core skills and ensuring lifelong learning for all are major challenges of skill training systems [5].

In addition to ensuring the quality of basic education through the general education system, changing training approaches to equip individuals to have better performance (with more emphasis on learning by doing work, teamwork, and creative thinking) and developing valid and efficient evaluation methods that can be useful in identifying necessary skills for employers in students, are of crucial importance [8].

Although each country has its particular economic status, it is important to define the basic principles of an effective TVET system, as such principles determine the level of implementation of core skills [10]. Several reports on the use of general skills in TVET systems showed that while these skills are determined and prioritized, the presentation, evaluation, and reporting of these skills are often ignored, and there is a clear need for an executive strategy based on a comprehensive approach that covers all elements of the educational system [6-11].

Certainly, the implementation of core skills in TVET systems creates important challenges that potentially affect curriculum structures, exercises, practical activities, training and professional development of instructors, institution management, and evaluation and reporting mechanisms.

Implementing a skill system is not a simple task and depends on a variety of factors:

- Historical and institutional context, including the authority of TVET institutions to form or regulate executive and educational programs;

- Different methods of monitoring changes in educational systems; and

- Relative importance of new programs and guidelines, educational/learning documents, new formative and compressive assessment tools, and/or educational plans for trainers, educators and managers of skill training systems and professionals.

Smith introduced the policy lifecycle approach, as a comprehensive strategy for designing a TVET system that helps trainees to acquire the skills necessary for the labor market, to ensure the implementation of programs with an emphasis on

key skills, which its key skills are depicted in Figure 2 [21]. Foresight is a key element of each plan to achieve development and progress. Predicting skills necessary in the future is essential for the rapidly changing labor market. Effective methods to predict future skill requirements and preventing possible mismatch are as follows:

- Ongoing dialogue between employers, professors, and trainers;

- Coordination between government agencies;

- Information systems of the labor market; and

- Employment services and performance monitoring of educational institutions.

While there is a wide spectrum of job skills worldwide, the development of skills from the perspective of the life cycle in dimensions of creating, maintaining, and improving competencies and skills should be emphasized. A holistic approach to developing skills includes the following features:

- Access to good basic training;

- Development of cognitive and core skills (literacy, calculation, communication, problem-solving and learning ability, etc.); and

- Availability of continuous education opportunities [22].

Therefore, teaching people key skills not only prepares them for future job roles but also helps them to continue their jobs and improve the quality of their work, which leads to achieving sustainable national growth and should be considered a major goal of TVET systems worldwide.

Conclusion

Investigation of TVET systems shows the importance of identifying and incorporating key and core skills into routine training programs. These skills, which include hard and soft skills, prepare individuals for future jobs and provide employers with greater guarantees of job retention and improving the quality of work. Job stability and availability of skilled and efficient personnel are the most important elements to achieving economic and social development, leading to sustainable national development.

Table 1   Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
population	TVET	**Other training systems except TVET**
subject	Skills, qualifications, hard skills, and soft skills	**All items except skills, qualifications, hard skills, and soft skills**
Study design	Different quantitative, qualitative, and combined studies, high quality, valid, and credible reports and documents	**Low-quality studies with no structure, and documents with no clear reference**
language	Persian and English languages	**Languages other than Persian and English**
Time	1950	**Since now**

Table 2: Features of included articles/reports

Row	Author/institution/organization	Year	Subject	Country	Type of study/report
1	Ministry of Science, Research and Technology	2018	Skill Development in universities and higher education centers	Iran	Report
2	Chenoy	2019	Skill development in TVET	India	Review Article
3	Brewer	2015	core work skills into TVET	Australia, Chile, India, Jamaica, The Philippines, Malawi	Report
4	Ismail	2014	Skills in TVET Curriculum	Nigeria	Experimental Study
5	ILO	2018	STEM in TVET	International (17 country)	Curriculum Guide
6	Confederation of British Industry	2014	SKILLS SYSTEM in TVET	UK	Guideline
7	Romadhoni	2019	Systematized Interpersonal Skills	Nigeria	Qualitative Study

Row	Author/institution/organization	Year	Subject	Country	Type of study/report
			Learning Models		

Table 3 Key skills of technical and vocational education & training

| Categorization	Key Skills
Learning to Learn	• Willingness to learn; • Using learning techniques to acquire and apply new knowledge and skills; • Job safety; • Following independent learning; • Responsibility for learning; • Abstract thinking; • Organizing, processing, and maintaining information; • Interpretation and transmission of information; • Systematic research to find answers; • Effective and efficient use of time declining quality; • Choosing the best method to perform tasks; • Start, track, and complete tasks; and • Compatibility.
Communication	• Ability to read; • Reading, understanding and using content, diagrams, images, tables, and displays; • Understanding, speaking, and writing in a designated business language; • Writing based on the needs of the audience; • Effective listening and communication; • Listening to understand and learn; • Using a numerical system; and • Expressing ideas and views.
Teamwork	• Manage yourself at work; • Teamwork; • Interaction with colleagues; • Respecting thoughts and opinions of other members of the group; • Working based on group culture; • Understanding and participating in achieving the goals of the organization; • Planning and making decisions with others and supporting the results; • Taking responsibility for actions; • Creating partnerships and coordinating different experiences; • Strive for group consensus in decision-making; • Value other people's opinions; • Accept feedback; • Resolving conflicts; • Coaching, guidance, and feedback;

	• Effective leadership; and • Mobilizing the group for higher performance.
Problem-solving	• Creative thinking; • Independent problem solving; • Hypothesis testing; • Problem identification; • Considering context and conditions; • Identification and proposing new ideas for doing work (initiative); • Collecting, analyzing, and organizing information (planning and organizing); and • Planning and managing time, money, and other resources to achieve the goals.

Table 4: Comparison of key skills in technical and vocational education & training Programs of six Countries

Country	Key skills
Australia	Communication, teamwork, problem-solving, organizational innovation and skills, planning and organization, self-management, learning, technology
Chile	Verbal and written communication, reading and using a variety of texts, regular tasks, observing timeframes and quality standards, looking for alternatives and solutions when problems arise, effective work in the team
India	English language, communication, occupational safety and health, entrepreneurship, job presentation, self-management, ability to plan, organize and coordinate, leadership, ability to cope with stress, negotiation
Jamaica	Collecting, analyzing, and organizing information, transferring ideas and information, planning and organizing activities, working with others as a team, using ideas, solving problems, and using technology
Philippines	Communication, teamwork, problem-solving, planning, health, safety, and sustainable development

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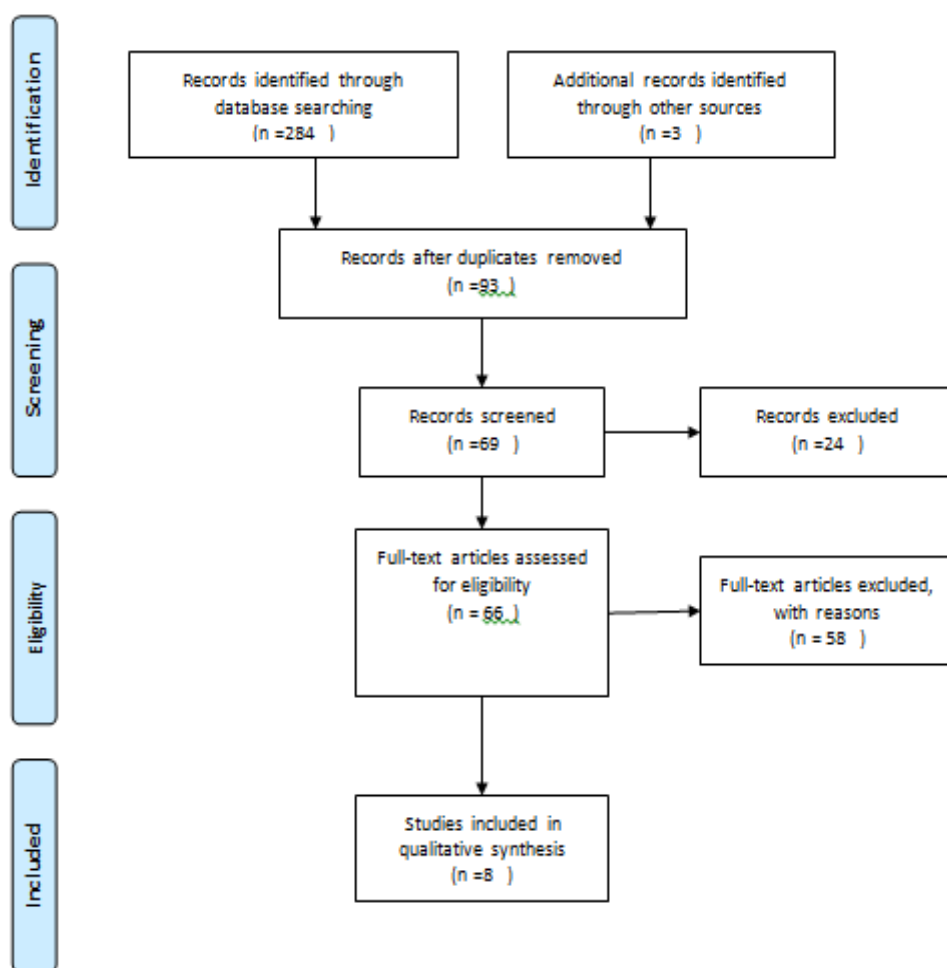
Figure 1 PRISMA flowchart
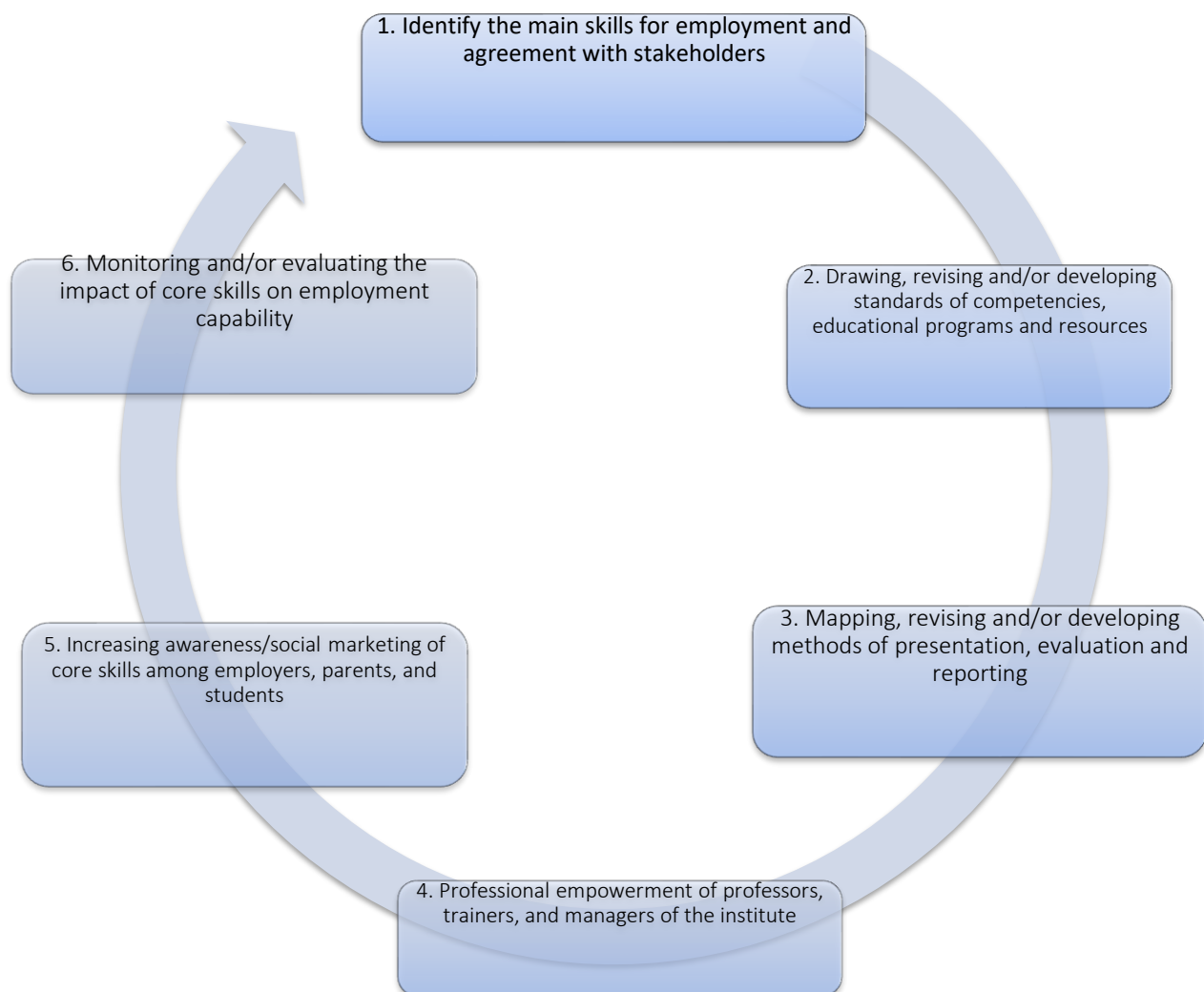
Figure 2   Smith's policy lifecycle approach in determining key skills of TVET.

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