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The Reform of Global TVET: Challenges and Possibilities

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Abstract

Global vocational education is facing new historical opportunities and challenges. Global and regional organizations such as UNESCO, the World Economic Forum, the World Economic Cooperation Organization, the European Commission are releasing reports to analyze the existing problems of vocational education and build international cooperation and exchange platforms. And international organizations and governments are constantly searching for a new pattern for the development of vocational education. This paper summarizes the challenges of vocational education in terms of sustainable development, global national and regional qualifications frameworks, digital transformation and optimization of vocational education ecosystems. And the paper also puts forward corresponding countermeasures and recommendations by combing pertinent reports and literature.

Key words: Global Technical Vocational and Education (TVET); TVET Current state and challenge; TVET reform and revolution; TVET sustainable development

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1. INCREASED ATTENTION BY INTERNATIONAL ORGANIZATIONS AND GOVERNMENTS TO VOCATIONAL EDUCATION REFORM AND SUSTAINABLE DEVELOPMENT OF VOCATIONAL EDUCATION

According to a joint study by the World Bank, the International Labor Organization (ILO) and UNESCO, there is a mismatch between skills and labor market supply and demand in the technical and vocational education and training (TVET) systems of many low-income and middle-income countries; OECD released a report on "Building a Future-oriented Vocational Education and Training System," which points out that there is still much room for improvement in the responsiveness, flexibility, inclusiveness, and innovation of global vocational education. The OECD report "Building Vocational Education and Training Systems for the Future" pinpoints that there is still much room for improvement in the responsiveness, flexibility, inclusiveness and innovation of global vocational education; and UNESCO organized the "World Teachers' Day Joint Conference", which states that there is a large gap in the number of teachers globally, and

the attractiveness of the teaching profession is insufficient, among other problems. International organizations and countries have explored various aspects of these issues:
Development of a new Vocational Education and Training Strategy (2022-2029) (hereinafter referred to as "the Strategy"), the Strategy aims to take into account the important theme that "Vocational education and training will make a significant contribution to economic recovery and sustainable development in the next eight years".

This new VET strategy aims to take into account the important issue that "VET will make a significant contribution to economic recovery and sustainable development over the next eight years". This new strategic vision for VET takes into account the current and future priorities of learners, society and the economy, contributing to recovery and resilience-building in the post COVID-19 era. Aligned with UNESCO's Future of Education Report 2021, the strategy calls for a new social contract to repair injustices while transforming the future of education. The strategy recognizes the need to address the challenges posed by six key dimensions that are relevant to progress towards the Sustainable Development Goals (SDGs) through an inclusive and proactive approach, specifically:

--Economic Recovery – The COVID-19 has accelerated certain labor market transitions, increasing post-Epidemic uncertainty about needed skills and competencies;

--Technological Change - Technology is affecting the labor market and the demand for skills, and there is a need to focus on inclusiveness and use technology to support human rights;

--Persistence of Informal Employment - Informal employment is still prevalent internationally and can no longer be regarded as a feature that will be replaced with the process of economic development;

--Demographic Transition - Different continents and countries are at different stages of the transition: regions with a high proportion of young people need a sustained and rapid expansion of education and training systems and large-scale job creation, while countries with a declining number of working-age citizens, a growing elderly population, and rising life expectancy need to provide skills for older workers Development;

--Social Issues - Factors such as political instability, conflict and climate change have led to large-scale social unrest and migration within and outside the country;

--Green and Sustainable Economic Transformation - More efforts are needed to mitigate climate change, curb biodiversity loss, restore ecosystems and reduce pollution.

The strategy takes into account the need to accelerate the achievement of the 2030 Agenda for Sustainable Development, with a particular focus on UNESCO's global priority areas of gender equality and Africa, and an enhanced focus on small island developing States. It also emphasizes the role of the private sector in further bridging skills demand and skills supply in the global labour market. In this context, and in full alignment with Sustainable Development Goal 4 (SDG 4) "Ensure inclusive and equitable quality education and lifelong learning opportunities for all", the Strategy aims at "supporting Member States in enhancing the relevance of their vocational education and training systems to provide employment, decent work, entrepreneurship and skills development for all young people and adults. It contributes to the full implementation of the 2030 Agenda for Sustainable Development".

Important elements of the strategy's action initiatives include:

Supporting Member States in analyzing their changing economies and developing the capacity to identify and anticipate the skills needed for the transition to a digital and green economy. UNESCO will work with partners to develop a "Global Skills Tracker" to document skills upgrading, retraining and re-skilling projects. Private sector and civil society partners will be mobilized to build on the UNESCO-UNEVOC work on green vocational education and training. UNESCO will also develop a global taxonomy and guidance framework for the development, assessment, validation and recognition of green skills in vocational education and training, in line with the Education for Sustainable Development implementation framework and the Berlin Declaration. UNESCO supports countries in digitizing and greening VET, building on work and tools already in place and developing new tools and frameworks.

2. BUILDING A PLATFORM TO PROMOTE THE BALANCED DEVELOPMENT OF GLOBAL VOCATIONAL EDUCATION

With different levels of productivity development in different regions of the globe, as well as uneven availability of resources and levels of educational development across countries, the joint World Bank, ILO and UNESCO report, Building Better Formal Vocational Education Systems, reveals the challenges faced by low- and middle-income countries and provides a roadmap for transformative reforms of vocational education, which are urgently needed in low- and middle-income countries. Vocational education reform to deliver on the promise of improved employment and productivity while sustaining economic transformation requires three interrelated shifts:

--the first shift is from striving for recognition to striving for excellence, aiming to raise the social status of vocational education from being perceived as a secondary education pathway to one that provides high-quality and relevant skills training;

--the second shift is from focusing on inputs to focusing on end results, emphasizing the importance of the importance of increasing the autonomy of

vocational education institutions while ensuring greater accountability for outcomes;

--the third shift is from speculation-based decision-making to evidence-based decision-making, addressing the scarcity of data and evidence in the vocational education system.

Collaboration between policymakers, institutions and training organizations, businesses and development partners is essential to implement effective vocational education reforms. By sharing experiences, best practices and lessons learned from countries facing similar challenges, the report Building Better Formal Vocational Education Systems inspires these stakeholders to work together to realize the true potential of vocational education and ensure a brighter future for low- and middle-income youth.

International organizations have actively built a platform for exchange and cooperation in vocational education, encouraging the sharing of knowledge and resources related to vocational education globally, narrowing the structural gaps in the development of vocational education, and promoting the balanced development of vocational education globally. The European Commission released a report on "Quality Investment in Education and Training", sharing the experiences and successful practices of European countries in education assessment, education policy and teaching technology, and realizing the sharing of resources in exchanges and discussions.

The European Forum for Technical and Vocational Education and Training (EFVET) supports and promotes cross-border cooperation in VET across the Western Balkans and to seek sustainable partnerships with the EU's education and training institutions. The project, in which Albania, Serbia, Montenegro and other countries from the Western Balkan region, together with EU partners such as Spain, Poland and Italy, participate, is a sustainable partnership between institutions. International exchange and cooperation in vocational education not only achieves knowledge sharing, but also builds bridges between cultural communities, fosters the spirit of cross-cultural understanding and cooperation, and will better promote the balanced development of global vocational education and even globalization.

3. FOCUS ON LABOR MARKET NEEDS TO IMPROVE ADAPTABILITY

With the upgrading of industrial structure and changes in various factors of productivity, the global labor market demand is undergoing profound changes, which have a great impact on vocational education and skills training. In 2023, OECD pointed out in its report Building Vocational Education and Training Systems for the Future that vocational education and training play a key role in ensuring that both young people and adults have the skills required by the labor market., but reforms are still needed on all fronts, and reforms of vocational education should focus on aspects such as responsiveness, flexibility and innovation in vocational education in order to respond to changes in labor force skill needs brought about by societal changes.

According to the Ministry of Education's report "Vocational Education and Training in Finland", Finnish vocational education and training pays attention to the changing needs of the labor market, relies on a well-developed "dual-track" education system, and promotes the use of new technologies in the Finnish education system in order to adapt to the fast-changing needs of the labor market. The World Economic Forum (WEF) continues to pay attention to vocational education and training in middle- and low-income countries, and believes that the match between vocational education and skills training and labor market demand is low, mainly due to the difficulties faced by learners, the lack of support for teachers, and insufficient incentives for training providers, and proposes that measures should be taken to promote the transformation and upgrading of vocational education and training in middle- and low-income countries and to improve the match with market demand. Korea's Ministry of Education has made positive attempts to match labor market demand by establishing a number of industrial demand-driven high schools to closely integrate workers' skills training with labor market demand. The attention paid by various countries and international organizations to the flexibility of vocational education will help to improve the matching of skills training and labour market demand.

4. ENHANCING THE ATTRACTIVENESS AND RECOGNITION OF VET TEACHING POSITIONS

Countries and international organizations around the world have attached great importance to the issue of enhancing the attractiveness of vocational education teaching positions and filling the global vocational teacher gap. The World Economic Forum (WEF) paid special attention to the situation of vocational education teachers in Future Employment 2023, which pointed out that in the fields of vocational education, pre-school education and special education, there is a large shortage of teachers and their attractiveness is weak. The report calls for increased investment in vocational education, pre-school education and special education, giving full play to the important role of vocational teachers in upgrading workers' skills and balancing labor supply and labor market demand.

In the report "Vocational Education and Training in Finland", the Ministry of Education of Finland describes

in detail the duties and salaries of teachers in the Finnish "dual-track" education system, and considers that teachers in vocational colleges and universities have a great potential for development, and hopes to rely on the perfect education system to continue to attract social talents to enter the field of vocational teaching and enhance the social attractiveness and recognition of vocational teachers. It is hoped that the perfect education system will continue to attract social talents into the field of vocational teachers and enhance the social attractiveness and recognition of vocational teachers.

5. UPGRADING THE EMPLOYMENT SKILLS OF VULNERABLE GROUPS FOR SOCIAL EQUITY

Global vocational education is concerned about the social adaptation of disadvantaged groups such as women, refugees, migrants, people with disabilities and the elderly, and is actively assuming its social responsibility to promote social equity and make vocational education more inclusive. UNEVOC puts forward the important issue of "providing equal opportunities for vocational and technical education and training for working and retired women" at the International Women's Day Conference, focusing on the fairness of vocational and technical training for women, improving women's employability, and promoting women's employment ability. This focuses on equity in vocational and technical training for women, the enhancement of women's employability and the promotion of fairness in the world of work.

The German Federal Ministry of Education and Research (BMBF) has developed the Vocational Orientation Program for Refugees, which is designed to help refugees find better employment by strengthening vocational education and training. The program is a 26-week course during which participants learn relevant professional knowledge and skills to prepare themselves for suitable training positions. In India, the Ministry of Education issued a plan for the inclusion of persons with disabilities in vocational and technical education, which encourages students with disabilities to participate actively in training courses through scholarships, the provision of books, uniforms and exemption from boarding and lodging fees. In Germany, the Federal Ministry of Education and Research has set up a special program, to provide financial support for the re-employment of the elderly and to create an equal and fair social environment. Vocational education promotes the employability and skills of disadvantaged groups and, while promoting the advancement of vocational education, it also contributes to the development of a fairer and more inclusive society.

6. EMPHASIZING THE GREEN ECONOMY FOR SUSTAINABLE DEVELOPMENT

Countries around the world are increasingly concerned about the green concept and are actively promoting the structural adjustment of their economies and industries in order to realize the sustainable development of education and the economy. UNESCO emphasizes in its Education Agenda 2030 that it is necessary to take advantage of the important role of the green economy to promote the transition of society to a digital society and a sustainable society, and to realize a win-win situation for vocational education and the economy and society by upgrading the green skills of the workforce and cultivating the talents needed by a green economy and society. The European Commission is also concerned about the green economy, and in its report on "Green Transformation of the Labor Market", it points out that skills upgrading and green development are mutually reinforcing. The report also assesses whether current education and training ensures equal access to green skills for citizens, analyzes barriers to and solutions for achieving green equity, and shares practices adopted by member states to create equal access to green education and training.

6.1 Development of global country and regional qualifications frameworks

Qualifications Frameworks, also known as Learning Outcomes Frameworks (LOFs), are a tool for describing and categorizing qualifications in education and training. It clearly defines the learning outcome standards for each level, i.e. the knowledge and skills required to achieve the qualification, by setting multiple levels. The system significantly improves the transparency and comprehensibility of qualifications. QFs can be categorized as national or regional, depending on their scope of application. Both types of QFs play an important role in promoting the coherence of education and training at all levels, strengthening the effective interface between education and training systems and the labor market, and establishing a lifelong learning system.

There is a close relationship between vocational and technical education (VET) and qualifications frameworks, which provide a standardized set of quality standards for VET and ensure that the educational services provided by different institutions and training providers meet certain quality requirements. At the same time, qualifications frameworks accredit technical and vocational education on the basis of learning outcomes, focusing not only on the transfer of knowledge but also on the enhancement of skills and competencies, which helps to ensure that the content of education matches the needs of the labor market. In addition, the qualifications framework supports the concept of continuous development and lifelong learning, encouraging individuals to receive continuing education and training at all stages of their careers in order to adapt to changing skills needs.

The UNESCO Global Inventory of National and Regional QFs 2022 points to significant differences in the development of QFs in different regions. Overall, Europe leads in the number and proportion of countries with advanced stages of QFs, followed by Asia-Pacific. By 2023, Europe has 41 countries with QFs in place, of which around 90% have reached the advanced stage and are effectively and hierarchically aligned to the European Qualifications Framework (EQF). In contrast, African, Latin American and Arab countries have been relatively slow in implementing QRFs, with most in the early stages of development. This paper takes the ASEAN Qualifications Reference Framework (AQRF), the European Qualifications Framework (EQF), and the Southern African Development Community Qualifications Framework (SADCQF) as examples of three regional qualifications frameworks, to summarizes and condenses the characteristics, effectiveness, and development trends of the qualifications frameworks of the different regions, which provides policy makers, educators, researchers, and experts with the latest developments in the field.

6.1.1 ASEAN Qualifications Reference Framework (AQRF)

The ASEAN Qualifications Reference Framework (AQRF) is a qualification measurement tool that uses learning outcomes as metrics to grade levels of learning complexity.The AQRF qualifications framework is intended to inform National Qualifications Frameworks (NQFs) and national qualifications systems. The AQRF is organized into four dimensions (1) Cognitive Competence (2) Vocational Competence (3) Personal Competence (4) Ethical Competence, covering two domains: Knowledge and Skills and Application and Responsibility. Development The AQRF has supported ASEAN community building, and the AQRF contributes to the ASEAN Charter's objective of developing human resources through closer cooperation in education and lifelong learning to empower the people of ASEAN and strengthen the ASEAN community in different ways. Under the ASEAN Economic Community (AEC), together with and complementary to the eight ASEAN Mutual Recognition Agreements (MRAs) and the ASEAN Mobility of Natural Persons Agreement (MNP), the AQRF plays a role in supporting and facilitating the mobility of skilled labor within the region to achieve the ASEAN Economic Community blueprint's goal of a freer flow of skilled labor.

Supported by the ASEAN Socio-Cultural Community (ASCC), the AQRF serves as one of the foundations for the establishment of National Skills Frameworks (NSFs) and as an incrementally important approach towards the realization of the ASEAN Skills Recognition Framework (ASRF). With the launch of the ASEAN Economic Community (AEC) and ASCC Blueprint 2025, the AQRF will continue to play an important role in facilitating the seamless flow of skilled labor across countries within ASEAN to achieve a high degree of economic integration and cohesion and to promote the continuous development of individual capabilities.

6.1.2 European Qualifications Framework (EQF)

The European Qualifications Framework (EQF), adopted by the European Parliament and the Council on 23 April 2008, aims to establish a harmonized standard for the mutual recognition of qualifications among EU Member States. The framework aims to increase transparency, compatibility and comparability between national qualification systems while preserving their diversity. The EQF applies to qualifications at all levels of education and recognizes formal, non-formal and informal learning outcomes, and plays a key role in promoting strategies for lifelong learning and in fostering the integration of education in Europe. the EQF consists of eight levels, each of which has clear indicators of knowledge and competences. The EQF has eight levels, each with clear indicators of knowledge and competence. In contrast, national qualifications frameworks in European countries usually contain 5 to 12 levels, which take into account factors such as emotions and attitudes, in addition to assessing knowledge and skills.

The design of frameworks based on learning outcomes has been widely used in many national and regional qualifications frameworks internationally and has become a common concept in the construction of qualifications frameworks, as is the case with the European Qualifications Framework (EQF), which, by defining learning outcomes, enables learners to identify what they have learned, what concepts they have understood, and what they have been able to accomplish at the end of their studies. In Finland, for example, the EQF has been used as a guide for designing curricula and teaching programs with learning outcomes at the core, and in Portugal, the EQF has been used to promote a learning outcomes-based approach to educational design.

Learning outcomes are widely used to describe qualifications, credential overviews and occupational standards in qualifications frameworks at the national and regional levels, and their application has been extended to other areas of education such as curriculum development. This approach has helped to ensure consistency and transparency in education and qualifications, and has increased comparability and mutual recognition between different education systems. The EQFs have been a source of inspiration for the development of national and regional qualifications frameworks around the world. More and more countries and regions are seeking to link their qualifications frameworks more closely with the EQF. For example: Australia, New Zealand and Hong Kong have conducted separate pilots comparing third country qualifications frameworks with the EQF. the EQF has been piloted with the Ukrainian National Qualifications

Framework (NQF) and the Southern African Development Community Regional Qualifications Framework (SADCQF).

6.1.3 Southern African Development Community Qualifications Framework (SADCQF)

The Southern African Development Community (SADCQF) is a comprehensive qualifications framework covering schooling, technical and vocational education and training (TVET), and higher education, which was established in 2011 by the Ministers of Education and Training and Science, Technology and Innovation of the Southern African Community (SADC). The SADC Qualifications Framework (SADCQF) adopts a design model dominated by a 10-tier structure, with the main aim of facilitating labour mobility in the region through the harmonization of education and training systems. The SADCQF plays an important role in practice: (1) providing a viable set of institutional mechanisms for qualifications in the SADC. (2) Promoting mutual recognition of qualifications across member states. (3) Facilitating credit transfers within and between member states and even beyond. Against the backdrop of global challenges, in particular the twin transformations of digitalization and green development, SADC is considering reform adjustments in the areas of digitization of certificates and qualifications management, guidelines for micro-credentials in the region and the development of a common qualifications profile for the region.

6.2 Accelerating digital transformation to optimize the vocational education ecosystem

In the digital economy, vocational education around the world is facing the challenge of digital transformation, and at the same time, there are opportunities to enhance the attractiveness of vocational education through digital upgrading, adapt to labor market demand, and shape a new ecosystem of vocational education. Since 2023, governments have issued policies and bills to guide and regulate the effective application of generative AI technologies in a manner that safeguards ethical norms and privacy security. The application of generative AI technology is subject to ethical guidelines and privacy and security.

6.2.1 Digital governance policies around the world

The adoption of the Artificial Intelligence Bill by the European Parliament in 2024, categorizes AI systems used to encompass education and vocational training as high-risk and clarifies their safety obligations. The release of the U.S. Office of Educational Technology's "Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations," in 2023, describes the opportunities for, and the challenges that will emerge from, the use of AI to improve education, and makes recommendations to guide policy development. In 2024, the release of the National Education Technology Plan 2024, provides actionable recommendations to address the digital use, digital design, and digital access divides, mentioning that emerging AI technologies may raise privacy concerns; The Australian Department of Education of the Australian Generative Artificial Intelligence Framework for Schools, proposes six guiding principles to guide all parties in the responsible and ethical use of AI in a way that is beneficial to students, schools, and the community.

In 2023, the U.K. Department for Education released the report "Generative Artificial Intelligence in Education," which describes the opportunities and challenges that generative AI brings to the education sector and makes recommendations for the effective use of AI; In 2023, the Canadian Center for Cyber Security released the "Guidelines for the Use of Generative Artificial Intelligence," which refers to the fact that generative AI allows educators to personalize learning plans for students to meet their individual performance, needs and interests; Sri Lanka 2023 Cabinet Sub-Committee releases the National Education Policy Framework 2023-2033 (Draft), with policy objectives covering: tools such as AI for facilitating collaborative learning and communication between learners and educators, and for assessing and improving learning, mentioning the use of relevant tools requires attention to ethical guidelines and data privacy and security issues.

6.2.2 Digital transformation initiatives in international organizations and regions

The Southeast Asian Ministers of Education Organization (SAMEO), in its report "Comprehensive Analysis of the Education Landscape in Southeast Asia", pointed out that digital technology has the characteristics of virtual reality and repeatable operation, and that the promotion of augmented reality and virtual reality technology is a key step in promoting the digital upgrading of vocational education and training, and that vocational education can take advantage of digital technology to enhance students' experience in simulating the environment of different skills. The International Centre for Technical and Vocational Education and Training (UNEVOC) promotes the digital transformation of vocational education by supporting digital innovation in TVET and providing guidance on digital skills upgrading through the pooling of information, the sharing of practical examples and the convening of webinars. The Zambia Vocational and Entrepreneurship Training Authority (ZVETA) has set up a proprietary platform to provide free digital skills classes to help enhance the digital skills of various groups, which is a solid step forward in advancing the digital transformation of vocational education. Throughout the world, various international organizations and regions have followed the trend of the times and actively seized the opportunity to realize the digital transformation and upgrading of vocational education and optimize the vocational education ecosystem.

6.2.3 Digital research in international organizations

UNESCO 2023 has released the report "Enhancing Vocational Education and Training (TVET) in Developing Countries through Digital Transformation" and here are the core highlights of the report: Five Dimensions of TVET Digital Transformation

Digital transformation in technical and vocational education and training (TVET) refers to the planned and systematic introduction of automation and streamlined processes in TVET systems through digital technologies, with the aim of increasing the scope, scale, efficiency and effectiveness of TVET, and ultimately contributing to the sustainability of TVET. The digital transformation of most institutions begins with the conversion of information into digital data, which "streamlines processes" through automation and the use of technology. For the TVET System's Digital Strategy, digital transformation is the culmination, which can be divided into three phases and five levels. There are three phases of transformation: the first involves representing information as digital data and organizing and integrating that information in digital systems; the second involves automating processes using digital tools and then streamlining them by optimizing digital applications; and the third refers to the transformation of the entire institution. Of these, it is worth noting that the transformation of institutions and systems is directly dependent on the new digital skills (including digital literacy, data literacy, technology skills, and digital threat awareness) possessed by practitioners, administrators, and policymakers. TVET's five dimensions of digital transformation refer to (1) technological change (2) curricular and credentialing transformation (3) pedagogical reforms (4) sustainability and resilience of technical and vocational education (TVET) Sustainability and Resilience (5) Institutional Digital Transformation.

The first level focuses on technological change: technological change is made up of the trinity of systems, data and efficiency. This covers a wide range of technology applications and interventions that can be broadly categorized as infrastructure and administrative. "Infrastructure" refers to the acquisition of hardware, software, human resources, space, and other resources needed to integrate technology into a TVET campus or system. The "administrative" aspect refers to the creation of the infrastructure and process data needed to digitize information, including student enrollment, course and completion records, employee records, performance evaluations, and financial records, and to automate routine processes.

The second level depends on curriculum and qualification transformation: digital competencies are essential for learners' success in school, employment and continuous development in the workplace. In recent years, with the introduction and optimization of digital competency frameworks, the qualification competencies that TVET teachers need to possess have been clearly regulated, prompting teachers to engage in more individual or collaborative learning through a variety of technologically-assisted methods, including game-based learning and intelligent simulations. However, there is a need to integrate these new and evolving knowledge and technologies (e.g., new skills such as cybersecurity, programming, or cloud computing) into TVET teachers' curricula.

The third level is based on pedagogical reform: Pedagogical reform is based on the introduction of new technologies and tools into the classroom, combined with new pedagogies to support the use of digital tools. In other words, pedagogical reform is organized around three components: new teaching methods (e.g., online teaching, blended learning, mobile learning, etc.), new learning and assessment tools (e.g., MOOCs catechism courses, diversified learning platforms, generative AI, simulation and immersive learning technologies, virtual and distance assessment, etc.), and new pedagogical approaches (e.g., game-based digital learning (DGBL)).

The fourth level hinges on TVET sustainability and resilience: the digital transformation of TVET is at the heart of global sustainable development. The Strategy for Technical and Vocational Education and Training 2022-2029, published by UNESCO, advocates a strategic focus on inclusiveness and skills development. In considering the digital transformation of technical and vocational education and training, policymakers and practitioners need to give serious consideration to both integrating the notion of the right to education into global citizenship and promoting technical and vocational education and training institutions as places for social integration, cohesion-building and green citizenship.

The fifth dimension focuses on institutional digital transformation: Digitalization involves managing change because it changes almost all job roles in the TVET system, and institutional digital transformation is a complex challenge. The introduction of institutional digital technology (especially the transformative use of technology) involves institutional leadership, planning departments, technologists, administration, and instructional staff. As a result, instructional, technical, administrative, and managerial skills, financial resources, and access to digital services, as well as other contextual factors that may arise between resource-rich or resource-poor rural or urban TVET campuses and the communities and industries they serve, have a significant impact on the ability to digitally transform.

7. RECOMMENDATIONS

7.1 Building an Asia-Pacific Economic Cooperation (APEC) collaborative digital cooperative community for industry-teaching collaboration in vocational education

Establishing a community of cooperation for digitalization of vocational education and industry-teaching collaboration, a partnership for close communication and mutually beneficial cooperation based on "shared vision, shared resources and shared governance". Based on the internationally accepted standards, practices and perceptions, the community will consult and explore areas of cooperation with counterpart institutions, organizations, school-enterprise cooperation and stakeholders in the Asia-Pacific region. To seek support from their respective governments, study and determine specific cooperation plans, and establish and improve specific working mechanisms based on the established cooperation structure of the two sides:

Through communication, issues are clarified, joint needs and interests are discussed, and common goals and values are established. Policy measures, work strategies and master plans are developed on the basis of a vision built on shared goals and values;

Decompose the tasks and refine the process based on their respective strengths and previous experience in collaboration, and define the powers and obligations of each party under the conditions of respecting the autonomy of the respective subjects, maintaining continuous communication, establishing a relationship of trust, and complying with the basic norms. To develops specific programs, secures necessary resources and implements actions in accordance with the overall plan and established processes, fulfilling the responsibilities of different parties.

Review and summarize the effects of synergies as one, and enhance social capital and related problem-solving capacity. And expanding the multiplier effect of One Synergy results, negotiating the need and possibility of future collaboration, and building a common narrative and further cooperation among the members of the common collaborative. Based on a common vision, shared resources and the concept of common governance, the Asia-Pacific Vocational Education Industry-Education Collaboration and Digitalization Cooperation Community focuses on building and sharing for the benefit of the people in the Asia-Pacific region, and is a community that pursues common interests. Compared with partnerships such as consortiums, alliances, and coalitions, the community is a more developmental and synergistic common collaborative body, and its synergistic process is a continuous and progressive collaborative process.

From the strategic level, in the process of seeking vocational education industry-education synergy digital cooperation one synergy, firstly, we should take the educational consensus as the medium to shrink the cause of the goal, focusing on the education function in the function of talent cultivation, focusing on the industrial synergy, integrating the industrial community into the educational community, and providing the key talent support for the common development of the Asia-Pacific economy. And secondly, we should gather the strength of all parties with the goal of mutual benefit and win-win, effectively play the roles of countries, markets and social organizations, and actively absorb the participation of diversified main bodies.

Thirdly, to gather the wisdom of all parties with the bond of pluralistic common governance, and play the role of professional support and think-tank service in the Asia-Pacific region. And fourthly, to pursue the pursuit of development with the same boat to accumulate development energy, highlighting the humanistic exchanges, promoting the people's livelihoods and well-being, and eliminating the cultural barriers to lay a solid foundation for building a sustainable community. The community needs to follow the general norms, laws and logic of education in a comprehensive manner and seek collaboration with other potential members of the community in this way. In the specific field of vocational education, which is directly facing the labor world, skill society and people's well-being, the construction of the community should be based on the important support of the industry and enterprises as a prerequisite and key element, and school-enterprise cooperation and integration of production and education as an important guide and basic path, and should focus on the social aspect and public participation and social benefits.

In particular, the construction of vocational education community involves the industrial chain, supply chain and the cultivation of technical and skilled talents in all aspects, which requires systematic thinking and top-level design. International characteristics, the general characteristics of the global community, on the one hand, bound by the established international norms, and on the other respect for the international cross-border, cross-cultural, cross-regional initiatives and projects operation of the general laws and relevant practices. It is the characteristics of the field, in which the Community must reflect national conditions, laws and regulations and relevant requirements, fully respect local customs, and strive to plan cooperation in accordance with local conditions, develop together with local materials, and achieve win-win results by taking root on the ground.

7.2 Building an international platform for sharing resources for vocational education in the digital economy

First, the general objective of the digital economy vocational education resource sharing platform is established. It is goal-oriented, leading action and practice, focusing on the holistic requirements of the "world of

work", providing scenarios for constructing knowledge in action, and adopting a variety of architectures for presenting learning content. In the construction process, attention should be paid to deficiencies in content quality, application value, construction standards and sharing guarantee, so as to explore and innovate, and establish a new paradigm for vocational learning under digitalization, to develop action competence in action-oriented learning, to construct knowledge in real-life problematic situations, to meet multifaceted design needs through a blended integrated learning system, and to pay attention to the learning experience and improve learning motivation.

Second, the platform construction process needs to deal with several important relationships. It needs to comply with the laws of vocational education, to support the training and development of skilled personnel, to belong to the characteristics of vocational education reflected in the planning and design of the resource base, to consider how to design monitoring indicators around the effectiveness of the resource base to serve the growth and development of skilled personnel. Then, accurately grasp the core functions of the resource base, reasonable delineation of the connotation of the scope of the resource base, the resource base should have its own relatively complete logic and relatively independent system.

The third is to mobilize the enthusiasm of member states, guide the construction and application, pay attention to the construction of policies and mechanisms, the establishment of resource certification and trading mechanisms to improve the quality of resources to build an important system of breakthroughs. The fourth is to pay attention to the logical relationship between the connotation of the resource base involving courses (structured courses), resources (granular resources) and scenarios (multi-scenario applications). The fifth is the establishment of a regional expert committee on the construction of professional teaching resource base for vocational education, to strengthen academic research, standard research, technical research, institutional research and practical research on the construction of teaching resources for vocational education, and to support the community of resource base construction.

7.3 The construction of digital learning resources for future vocational education should be emphasized.

The Internet paradigm is constantly upgrading, and advanced vocational education digital learning resources should help learners realize work-specific learning through information technology, so that they can meet the requirements of workers in the future work world. Learners should not only learn abstract knowledge points skill points, but more importantly have the ability to complete complex professional work tasks with the support of information technology digital learning resources. Digital learning resources is a professional work-based "integrated learning system", or "Tutorial Working System" (Tutorial Working System), is a blended integrated learning system, which reflects the typical work of the enterprise. The learning system is more than just a "show". Learning systems not only present "factual" knowledge, but more importantly provide learners with opportunities and space for self-construction of knowledge in the teaching-learning process, and help learners complete work tasks in specific fields, environments and conditions. In the future, the new paradigm for vocational learning under digitalization will be to develop action competencies in action-oriented learning, to construct knowledge in authentic problem situations, to satisfy multifaceted design needs through blended and integrated learning systems, and to focus on the learning experience and motivation.

7.4 Conducting the Asia-Pacific Digital Economy Vocational Education Talent Skills Enhancement Project

First, strengthening cooperation between vocational education institutions and enterprises in the region. Vocational education institutions and enterprises are encouraged to jointly create digital talent training programs, including internships, scientific research projects and training courses, in order to enhance students' practical skills and industry knowledge, cultivate a group of composite talents who understand both industrial and digital technologies, continuously improve practitioners' digital literacy and professionalism, and assist the digital transformation and high-quality development of industries.

Utilizing the training bases for highly skilled personnel, practical training bases for industry-teaching integration, and tapping the district's high-quality training resources, in a bid to carry out advanced training and academic and technical exchanges for high-level digital talents, and accelerate collaborative education through industry-academia cooperation. Widely participate in international events, such as the World Skills Competition, and organize digital vocational competition projects in the Asia-Pacific region, such as intelligent manufacturing, integrated circuits, artificial intelligence, data security, etc., to promote learning and training through competitions, and select and train digital talents through competitions. Attracting the participation of large enterprises, universities and technical organizations through the competition, providing sponsorship and technical support, ensuring the professionalism and practicability of the competition, and providing internship or employment opportunities for participants. Through the establishment of multinational teamwork in the competition, participants from different countries are encouraged to work together to solve problems, enhance interaction and expand cultural and technical exchanges.

Second, to build an interdisciplinary cooperative network of vocational education institutions. Establishing vocational education alliances within the Asia-Pacific region encourages vocational education institutions, industry associations and enterprises to form interdisciplinary consortiums that can share resources and experiences. Conduct interdisciplinary curriculum design, whereby international vocational education institutions jointly design and develop interdisciplinary curricula. Besides, carry out interdisciplinary project-based learning related to practical problems and social needs and organize teams comprising teachers from different disciplines and students from different subject areas. They ensure that team members come from different cultural backgrounds, and develop multi-dimensional thinking and problem-solving skills. To establish shared teaching resources, practice sites and laboratory facilities within the Asia-Pacific region to encourage students from different cultural and professional backgrounds to learn interactively in the same environment and to develop teamwork and international competence. Meanwhile, implement an alliance for international internship and apprenticeship programs, whereby educational institutions within the alliance carry out international exchanges of students and international internships, and vocational education institutions set up a credit system to encourage students to participate in international internship programs.

Moreover, holding digital skills and employment fairs in the Asia-Pacific region, and organizing regular digital skills-related fairs or seminars to bring together educational institutions, are equally crucial. Most importantly, to enhance students' ability to apply digital skills in real work environments and increase their competitiveness in employment. For instance, to launch customized training for specific industries, and develop skills training courses for key industries in the Asia-Pacific region (e.g. e-commerce, fintech, smart manufacturing) to ensure that students master the specific skills required by the industry, and to shorten the gap between employment and market demand.

Governments of APEC member countries can encourage vocational education institutions to carry out interdisciplinary cooperation through financial support, tax incentives and policy guidance, such as the introduction of policies to support the establishment of innovation laboratories or incubators within vocational education institutions in cooperation with enterprises. They promote technological innovation and to transform research results into practical applications.

Third, rely on the cultural background and educational needs of each country, designing targeted training contents for vocational educators, encourage teachers to establish a sense of lifelong learning should not be neglected so as to let them adapt to the rapidly changing digital economy environment. In addition, it is highly desirable to carry out regional cross-border teacher training and exchange programs to enhance teachers' international perspective and digital skills, promote the sharing of teaching experience and cooperation, and organize short-term exchange visits for teachers from vocational colleges and universities to other countries to participate in local vocational education curricula and practices.

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