Capacity Building of TVET Trainers in a Developing Country Through Practice-oriented Curriculum Implementation

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Abstract

It is well recognized through numerous development cases that fostering high-quality technical human resources through excellent TVET (Technical and Vocational Education and Training) is crucial for the sustainable economic development of developing countries. The key to the advancement of TVET lies in effectively training high-quality trainers who possess both theoretical and practical educational capabilities to deliver training that aligns with industry demands. However, due to limited national support and lack of capacity building opportunities, the quality of TVET trainers in most developing countries remains inadequate. As a result, this leads to a shortage of high-quality technical human resources, which becomes a significant obstacle to sustainable economic development of corresponding country. Therefore, official development assistance aimed at promoting sustainable economic growth in these countries needs to prioritize the TVET sector, with particular emphasis on strengthening the competencies of TVET trainers. This study presents a case in which the capacity building of trainers at the FTVTI (Federal TVET Institute) in Ethiopia, a national university that trains TVET trainers, was effectively supported through a curriculum revision and related activities focused on practice-oriented education, as part of a project implemented by KOICA (Korea International Cooperation Agency). This case is expected to serve as a valuable reference for the sustainable capacity building of TVET trainers in developing countries through official development assistance in the future.

1. Introduction

1.1 TVET and Sustainable Econonic Development in Developing Countries

TVET refers to formal and informal education related to technical subject matters and hands-on skills associated with occupations or employment (UNESCO-UNEVOC, 2025). A steady supply of skilled labor is essential for sustainable economic development, making TVET development closely linked to sustainable economic growth (Okoth, 2023; Kronner, 2005). South Korea, which had no special resources to aid economic development, received Official Development Assistance (ODA) from developed countries from the end of the Korean War in

1953 until 1999. The transformation of South Korea from a recipient of ODA to a donor country starting from year 2000, and its ability to provide over $4 billion in ODA in 2025 (ODA Korea, 2025), can be attributed to the intensive development of technical human resources during its industrialization period. TVET of Korea, represented by vocational high schools and junior colleges, played an essential role in this process (KDI, 2013). It has been also reported that the TVET has played a crucial role in the economic development of emerging economies such as China and Vietnam (Fan et al., 2024; ADB, 2020), and many developing countries in Africa, South America, and Southeast Asia are also focusing on and making efforts to develop TVET for sustainable economic development.

In developing countries, for TVET to effectively contribute to the nation's sustainable economic development, it is essential that TVET systems are sufficiently developed to continuously supply high-quality skilled labors to the industrial sector. However, the reality is that many developing countries face significant challenges in advancing TVET. The key issues affecting TVET in these countries can be outlined as follows (Rao, 2024; Tom & Norton, 2016; World Bank Group, 2023):

- Curriculum mismatch: many TVET programs operate outdated, theory-oriented curricula that fail to align with the practical skills needed in the industrial sector
- Insufficient learning materials: both trainers and students often lack adequate and relevant learning materials that are aligned with the curriculum
- Lack of trainers' educational capacity: there is a shortage of qualified educators who possess the necessary theoretical and practical skills to effectively teach industry-relevant content
- Insufficient financial support: TVET institutions suffer from a lack of financial investment from both the government and the industrial sector
- Low social recognition: the societal perception of TVET institutions remains low, which makes it difficult to recruit competent trainers and students, and limits the social acceptance of TVET graduates
- Lack of industry engagement and participation: due to the low awareness of TVET's importance and limited capacity within industries, there is a severe lack of active participation from the industrial sector in TVET institutions
- Inadequate educational infrastructure: financial constraints lead to the insufficient provision of essential educational facilities and ICT infrastructure within TVET institutions

1.2 Official Development Assistance for TVET

The issues surrounding TVET of developing countries, as outlined above, are interrelated, making it difficult to determine which problem is the most critical. However, one thing is clear: as TVET advances, most of these issues can be addressed collectively. When TVET develops and produces skilled human resources who contribute to the industrial sector, the industry itself progresses. As the contribution of TVET to industrial development grows, public recognition of TVET improves, and its importance increases. As TVET gains national significance, it naturally leads to increased support from both the government and industry. With sufficient support, TVET institutions attract highquality trainers and students. These excellent trainers and students, in turn, further enhance TVET, completing a sustainable development cycle. Given that it is not an easy task for developing countries facing financial difficulties to independently create opportunities for the advancement of TVET, it is necessary for ODA to take an active interest in this matter. In fact, many international organizations are already providing ODA to support the development of TVET in developing countries (World Bank Group, 2023), and individual countries such as Germany, Japan, South Korea, and other countries have also joined this effort (Federal Ministry of Economic Cooperation and Development, 2017; Juwitasari, 2021; Lee et al., 2020). In the case of South Korea, since the early 2000s, it has provided TVET ODA to many countries, including Vietnam, Bangladesh, Nicaragua, Pakistan, Nepal, Cambodia, and many other developing countries (Lee et al., 2020; Lee et al., 2023).

Ethiopia, the focus of this study, has been also making continuous efforts to develop TVET through its government initiatives; however, like other developing countries, it continues to face challenges such as misalignment with labor market needs, low social recognition, ongoing lack of financial support, inadequate theoretical and practical teaching capabilities of trainers, outdated educational environments and a shortage of practical equipment, insufficient ICT infrastructure, and a lack of motivation among trainers (Ministery of Science and Higher Education, 2020; ILO, 2022; African Center for Economic Transformation, 2024). To help resolve these issues, KOICA has been conducting ODA for the sustainable development of Ethiopia's TVET for 5 years since 2021. KOICA's TVET ODA in Ethiopia aimed to promote the development of TVET through enhancing the capacity of TVET managers and trainers, thereby contributing to the sustainable economic development of Ethiopia. This study will focus on how sustainable capacity building of TVET trainers as well as sustainable TVET development have been promoted through the practice-oriented curriculum implementation activities in the KOICA's Ethiopia TVET ODA project.

1.3 Objective and Contribution

The target of the practice-oriented curriculum implementation activities of the KOICA project discussed in this paper is Ethiopia's FTVTI. FTVTI is a university at the federal government level in Ethiopia that was established to provide practical, industry demand-oriented education for trainers of TVET institutions in Ethiopia (Federal Technical and Vocational Training Institute, 2025). The objectives of this paper are to introduce the KOICA ODA activities focused on practice-oriented curriculum implementation including textbook development, the practice equipment provision, and equipment-based practical training activities which were conducted to implement the practice-oriented curriculum, and to discuss their effects. The practice-oriented curriculum revision and the related activities have been carried out focusing on building the educational capacity of FTVTI trainers who are trainers of Ethiopia TVET trainers. Though those activities were carried out as part of the KOICA ODA project, they were mainly driven by the FTVTI trainers themselves, with guidance and consulting services of relevant KOICA experts, and were thoroughly focused to be practice-oriented so as to meet industrial needs. Surveys of participating trainers showed that these local trainers-led, thoroughly practice-oriented curriculum implementation activities significantly contributed to enhancing the trainers' competencies. The capacity building of FTVTI trainers, who train TVET trainers at the federal government level in Ethiopia, will greatly contribute to the sustainable development of Ethiopia's TVET system. This paper is expected to serve as a good reference model for effectively implementing TVET ODA in developing countries in the future.

2. Method and Approach

2.1 Method

The implementation of the practice-oriented curriculum in the KOICA project was applied to six engineering departments at Ethiopia FTVTI. They are Automotive Technology (AT), Electrical and Electronics Technology (EET), Information Technology (IT), Building Construction (BC), Road Construction (RC), and Garment Technology (GT) department. Table 1 shows the methods employed by the KOICA project to implement the practice-oriented curriculum in these engineering departments. The first method was to revise the existing theory-oriented curricula of the six engineering departments into practice-oriented curricula. To achieve this, a practice-oriented curriculum revision manual was first developed. The objectives of the curriculum revision manual development were to provide guidelines for the revision of the practice-oriented curriculum for the six engineering departments and to offer a template for creating a consistent curriculum handbook. In this process, the aim was to enhance the curriculum revision management capabilities of managers and trainers. After the completion of the curriculum revision manual, the curricula of the six engineering departments were revised according to the manual, aligning them with technological advancements and industry demands to establish practice-oriented curricula. During this process, the objective was to enhance the curriculum revision capacity of the trainers.

Table 1 *Methods for practice-oriented curriculum implementation*

| Methods		Objectives
Practice-oriented curriculum revision	Development of curriculum revision manual	• Guide curriculum revision of all departments to be practice-oriented. • Provide a standard template for the curriculum handbook. • Enhance curriculum revision process management capacity of mangers and trainers.
	Curriculum revision for 6 departments	• Revise the curriculum to align with advancements in technology and industry demands. • Revise the course profiles to be practice-oriented. • Enhance capacity of trainers in implementing curriculum revisions.
Textbook development	Development of textbook development manual	• Guide textbook development to align with the practice-oriented curriculum. • Develop and offer a standard template for the textbook.

Methods	Objectives
	• Enhance process management capacity of mangers and trainers in textbook development.
Textbook development	• Develop textbooks to support the revised practice-oriented curriculum. • Enhance educational capability of trainers involved in the textbook development.
Practice equipment provision	• Provide equipment and materials to support the revised practice-oriented curriculum. • Improve educational environment.
Equipment-based practical training	• Enhance practice-oriented educational capability of trainers who use the equipment.

The second method for implementing the practice-oriented curriculum was textbook development. Textbook development began with the development of a textbook development manual, and the textbook development process followed the guidelines outlined in the manual. The objectives of developing the textbook development manual were to guide the development of textbooks that align well with the practice-oriented curriculum and to provide a standard template for the textbooks, ensuring the effective and consistent development of textbooks. The development of textbooks according to the manual was aimed at supporting the revised practice-oriented curriculum and enhancing the educational capabilities of trainers involved in textbook development.

The third method was practice equipment provision. The KOICA project provided practice equipment suitable for the revised practice-oriented curriculum to the six engineering departments. Additionally, equipment to improve the educational environment was also provided. To enhance the educational capabilities of trainers utilizing the provided equipment, equipment-based practical training was offered to the trainers of the six engineering departments as fourth method for the practice-oriented curriculum implementation.

2.2 Approach

For the implementation of the practice-oriented curriculum to lead to the sustainable building of the educational capacity of FTVTI's managers and trainers, it is crucial that they actively participate in the entire implementation process, gaining experience, learning, and staying motivated. Therefore, the KOICA ODA project applied an approach in which the managers and trainers of FTVTI took the lead, with guidance and advice provided by KOICA experts and industry experts. Fig. 1 shows the organizational structure established to implement the practice-oriented curricula of 6 engineering departments at FTVTI.
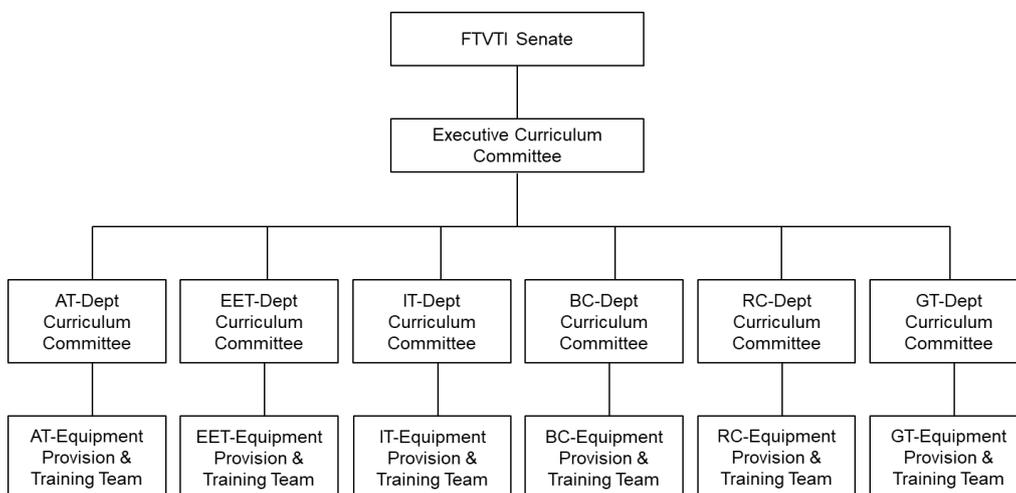
Fig. 1 *Organizational structure to implement practice-oriented curriculum of FTVTI (AT-Automotive Technology, EET-Electrical and Electronics Technology, IT-Information Technology, BC-Building Construction, RC-Road Construction, GT-Garment Technology)*

The most fundamental and core organizational unit for the implementation of the practice-oriented curriculum is the Department Curriculum Committee (DCC) for each of the six engineering departments. The DCC includes all trainers of the respective department, as well as KOICA experts and industry experts. The chairperson of the DCC is the department head, and most of the practical activities related to the implementation of the practice-oriented curriculum, such as curriculum revision, textbook development, and some activities related with equipment provision were carried out by the department's trainers themselves of the DCC. KOICA experts were responsible for providing relevant advice and guidance, as well as handling equipment provision and equipment-based training. Industry experts played the role of offering advice from industrial perspectives. In order to support the practice-oriented curriculum from the viewpoint of practical training, a special Equipment Provision and Training Team (EPTT) was established under each DCC. The EPTT included KOICA's equipment experts who, in collaboration with the department's trainers, were responsible for the supply, installation, and hands-on training of the equipment. The trainers involved in the DCC and EPTT actively participated in the entire process of implementing the practice-oriented curriculum, thereby enhancing their sustainable educational capabilities. As a result, they are expected to contribute to the sustainable development of FTVTI, and ultimately, contribute to enhancing the practical educational capabilities of Ethiopian TVET trainers that FTVTI trains.

The DCCs of the six engineering departments are managed by the Executive Curriculum Committee (ECC). The ECC includes educational administrators from FTVTI, as well as representative experts from KOICA. The chairperson of the ECC is the academic vice president of FTVTI. The ECC sets the direction and policies for the implementation of the practice-oriented curriculum, manages the implementation schedule, and supports the consistent and effective execution of the implementation work across the six engineering departments. Through the ECC, it is expected that FTVTI's administrators strengthened their sustainable educational management capabilities by actively participating in the management of the practice-oriented curriculum implementation under KOICA ODA. ECC was controlled by FTVTI Senate, the highest decision-making body of FTVTI.

3. Implementation

3.1 Revision to Preactice-oriented Curriculum

The implementation of the practice-oriented curriculum for the six engineering departments at FTVTI began with the revision of the existing theory-oriented curriculum into a practice-oriented one. Fig. 2 illustrates the process of revising the curriculum to a practice-oriented one adopted by the KOICA ODA project.
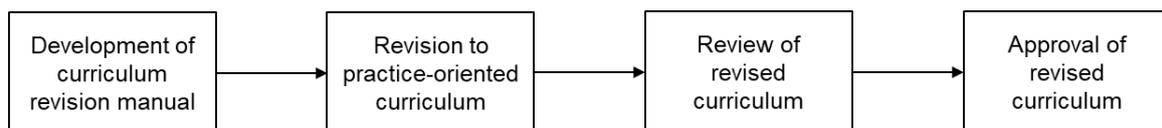
Fig. 2 *Revision process of practice-oriented curriculum*

First, ECC developed a curriculum revision manual to ensure a consistent and efficient transition to a practice-oriented curriculum. The revision manual includes the procedures for curriculum revision, considerations during the revision process, guidelines for writing the curriculum handbook, and a standard template for the handbook, which contains an executive summary and course profiles for all subjects included in the curriculum. A key focus in the development of the practice-oriented curriculum revision manual was the template for the detailed course outline of the course profile. Fig. 3 shows a simplified version of the course profile template included in the practice-oriented curriculum handbook. The new course profile template requires a detailed description of both theoretical and practical content for each week of a 16-week semester, as well as clear specifications for the tools and materials to be used in the practical sessions. The detailed course outline for each subject in the curriculum was used as a basis for the development of corresponding textbook and the provision of practice equipment. Specifically, each textbook was developed to cover the weekly educational content outlined in the detailed course out-line, and the list of practice equipment to be provided was created based on the equipment and materials specified in the detailed course outlines.

Department of Information Technology				
Program	Bachelor of Technology in Information Technology			
1. Instructor/s (teaching team members) Information				
2. Course Information				
3. Course Objectives				
4. Method of Instruction				
5. Course Learning Outcomes				
6. Detailed Course Outline				
Week	Topics to be covered(# lecture hours)	Topics to be covered (# lab hours)	Learning Outcomes	Lab materials / equipment / devices
1				
...				
16				
7. Suggested texts and reference materials				
8. Assessment methods				
9. Academic Honesty				
10. Submitting Date				
11. Classroom Behavior				

Fig. 3 *Simplified course profile temple of practice-oriented curriculum*

The DCCs of the six engineering departments at FTVTI revised their curricula into practice-oriented ones following the curriculum revision manual. The results of the revision for each department were compiled into a curriculum handbook using the curriculum handbook template presented in the manual. All trainers from each department participated in the revision process through the DCCs, which were led by the department heads. Specifically, each trainer revised the course profiles for the subjects they were responsible for, using the template from the revision manual to develop practice-oriented versions. During this process, trainers received support from external advisors, such as KOICA experts and industry experts. The area that required the most effort in the revision to a practice-oriented curriculum was the development of the detailed course outline for each subject. Through the development of these detailed course outlines, trainers were encouraged to strengthen their ability to specifically and systematically design how they would teach their subjects. In particular, by guiding them to design the content with a focus on practical training, it became the starting point for strengthening their sustainable practical training capabilities. Fig. 4 shows a simplified example of the detailed course outline developed as part of the practice-oriented curriculum.

6. Detailed Course Outline				
Week	Topics to be covered (2 lecture hours)	Topics to be covered (3 lab hours)	Outcomes	materials/equipment/devices
1	1.1 Introduction to Data communication system	1.1 Visualize different topologies in simulator programs.	5.1.1	PC, Internet,
2	1.5 Transmission Media(Guided Media Types and Unguided Media Types)	1.3 Visualize different Media types	5.1.1 5.1.2	PC, UTP, Networking tool kit, Coupler/Extender and
3	2.1 Communication and Layer 2.2 The Seven Layers of an OSI Model	2.1 Check Web browser-server communication (IP address,	5.1.4	PC, Internet, network simulatoion
4	2.3 TCP/IP Communication Models	2.3 UTP Cable construction	5.2.1	PC, UTP construction
5	3.1 IPv4 Addresses (Anatomy of an IPv4 Address, Binary-to-Decimal	3.1 Switch console and network port connection	5.2.2 5.1.3	PC, Switches, Console cables
6	3.3 Assigning Addresses 3.4 Planning to Address the Network	3.4 Static or Dynamic Addressing for End-User Devices	5.1.3	Desktop computer

7	3.6 Calculating Network, Hosts, and Broadcast Addresses(Subnetting,	3.5 Configuring IP Addresses and Subnet Masks on the Hosts	5.1.3	Desktop computer
8	Midterm Exam			
9	4.1 Ethernet Frame, Encapsulating the Packet	4.1 Packet Sniffing using WIRESHARK	5.1.5	PC, Switches, patch cables
10	4.4 CSMA/CD: The Process 4.5 Ethernet Physical Layer	4.2 Performing an Initial Switch Configuration	5.1.5	PC, Switches, patch cables
11	4.7 Legacy Ethernet: Using Hubs 4.8 Ethernet: Using Switches	4.3 VLSM & Route Summarization	5.1.5	PC, Switches, patch cables
12	5.1 Cisco IOS Access Methods 5.2 Introducing Cisco IOS Modes	5.1 Basic router configuration 5.2 Configuring the WAN link	5.1.9, 5.1.10	PC, Router Cisco 2800 series
13	5.6 IOS Configuration Modes 5.7 Naming Devices	5.4 Study of basic network command and Network	5.1.10	PC, Internet, Switches (Cisco Catalyst
14	6.1 Describe the devices of wireless technologies	6.1 Connect to a Wireless network 6.2 Configure Basic Settings	5.1.8	3G/4G router Wireless Access Point
15	7.1 LANs: Making the Physical Connection	7.1 Sharing a Printer in Windows 7.2 Configuring Windows Local	5.1.7	PC, router, Switches, Console cables, packet
16	Final Exam			

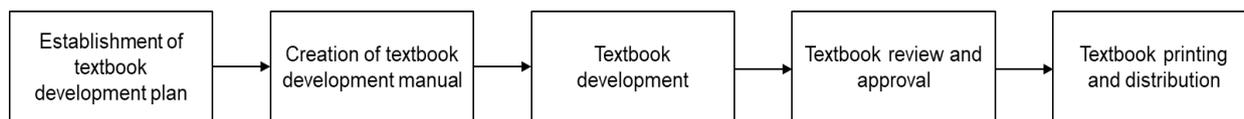**Fig. 4** *A simplified example of detailed course outline*

After revising the curriculum into a practice-oriented version, the DCC developed a textbook development plan based on the course profiles of the revised curriculum. The textbook for each course was primarily developed by the trainer or group of trainers responsible for that course, with guidance and consultation provided by KOICA experts and industry experts. This approach was intended to ensure that the trainers' educational capabilities were sufficiently enhanced during the development process. The development plan included over 18 major textbooks for each engineering department, with a goal of developing a total of 113 textbooks across the six departments. Additionally, referring to the detailed course outlines of the revised curriculum, the DCC created a list of the practice equipment needed for the practice-oriented curriculum implementation.

The revised practice-oriented curricula of the six engineering departments were reviewed by the ECC and reported to the Senate, the highest decision-making body at FTVTI, for approval. The FTVTI Senate highly appreciated that the practice-oriented curricula aligned with FTVTI's development goals and approved their implementation.

3.2 Textbook Development

Textbook development was a crucial method for implementing a practice-oriented curriculum aimed at the sustainable capacity building of FTVTI trainers. The goal of textbook development extended beyond simply providing systematic teaching materials for trainers and students to teach the revised practice-oriented curriculum appropriately. Specifically, it included the additional objective of strengthening the professional training capabilities of trainers during the development process. In order to achieve the goal, textbook development was led by FTVTI trainers, with KOICA experts and industry experts providing support. Fig. 5 shows the overall process of textbook development. By participating in and experiencing the entire process of developing the textbooks, trainers were able to enhance not only their subject matter expertise but also their ability to improve the textbooks and manage the development of additional textbooks in the future.

The textbook development plan, created by the DCCs of the six engineering departments at FTVTI, outlined the gradual development of a total of 113 textbooks in three phases, covering almost all of the major subjects in the revised practice-oriented curricula. The development period for each phase ranged from one to one and a half years. To ensure the consistent and efficient development of a large number of specialized textbooks, the ECC developed a textbook development manual. The manual not only provided specific guidelines for textbook developers but also offered a template for the textbooks, enabling consistent development across all developers from 6 departments. The textbook development manual ensured that the textbooks were thoroughly aligned with the detailed course outlines of the relevant subjects in the practice-oriented curriculum. As a result, the use of the developed textbooks in training is supposed to allow for the effective implementation of the practice-oriented curriculum.

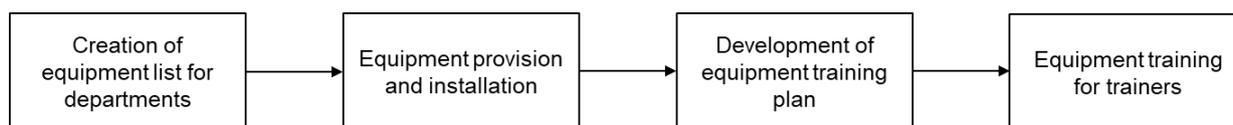| Establishment of textbook development plan	→	Creation of textbook development manual	→	Textbook development	→	Textbook review and approval	→	Textbook printing and distribution

Fig. 5 *Textbook development process*

Table 2 shows the list of textbooks developed in three phases for the implementation of the practice-oriented curriculum in the Information Technology department. Road Construction, Automotive Technology, Electrical and Electronics, Building Construction, and Garment Technology departments also developed almost same number of textbooks to support their practice-oriented curricula. The developed textbooks were reviewed and approved by the DCC before being printed and distributed. Considering the learning environment of local students, who primarily use electronic devices such as smartphones to access educational materials, the textbooks were distributed to students in PDF format, while printed textbooks were distributed to libraries and departments.

Table 2 *Textbook list developed by trainers of Information Technology department*

Phase 1 : February 2023	Phase 2 : February 2024	Phase 3 : February 2025
Advanced database system	Web design and development I	Information system security
Advanced networking	Mobile computing	Multimedia system and development
Computer organization and architecture	Data structure and algorithms	Network administration
Fundamentals of aatabase	Object oriented programming	Operating system
Fundamentals of networking	Advanced programming	Web design and development II
Programming using C++	Object oriented system analysis and design	Window programming

3.3 Equipment Provision and Practical Training

To appropriately support practical training according to the practice-oriented curriculum, practice equipment was provided for each department, and equipment-based practical training was conducted for the department's trainers. Fig. 6 illustrates the equipment provision and training process.

Creation of equipment list for departments	→	Equipment provision and installation	→	Development of equipment training plan	→	Equipment training for trainers

**Fig. 6** *Equipment provision and training process*

First, a list of necessary practice equipment was created to support the revised practice-oriented curriculum by the DCC and EPTT of each department. The detailed course outlines of the curriculum were used as reference material for compiling the list. The actual supply and installation of the equipment were primarily carried out by KOICA experts with the assistance of department trainers, and equipment inspections were mainly conducted by the department trainers. After the equipment provision was completed, an equipment-based training plan was developed under the leadership of EPTT, and hands-on training materials were created by KOICA experts. Hands-on training by KOICA experts for all department trainers was conducted over 8 weeks for each department. The equipment-based training focused on enhancing the practical training capabilities of the trainers from six engineering departments of FTVTI, and it is expected that the strengthened practical training capabilities of the trainers will play a key role in the implementation of the practice-oriented curriculum.

## 4. Evaluation and Discussion

4.1 Evaluation

At the end of the implementation of the practice-oriented curriculum through the KOICA project, a survey was conducted with all trainers of 6 departments to assess the effects of the implementation. Fig. 7 shows the evaluation results of FTVTI trainers regarding the practice-oriented curriculum revision. 33.8% of the trainers evaluated that the curriculum revision through the KOICA project contributed very much to FTVTI's sustainable development, while 54.4% evaluated it as contributing. Additionally, 41.5% of the trainers evaluated that their participation in the practice-oriented curriculum revision contributed very much to their educational capacity building, while 49.2% evaluated it as contributing. This result shows that revising the curriculum to be practice-

oriented not only aligns with the development direction of FTVTI but also helped the trainers in developing their own competencies by proactively participating in the curriculum revision process. In the same survey, most of them expressed their willingness to actively participate in future curriculum revisions.

(a)   **(b)**
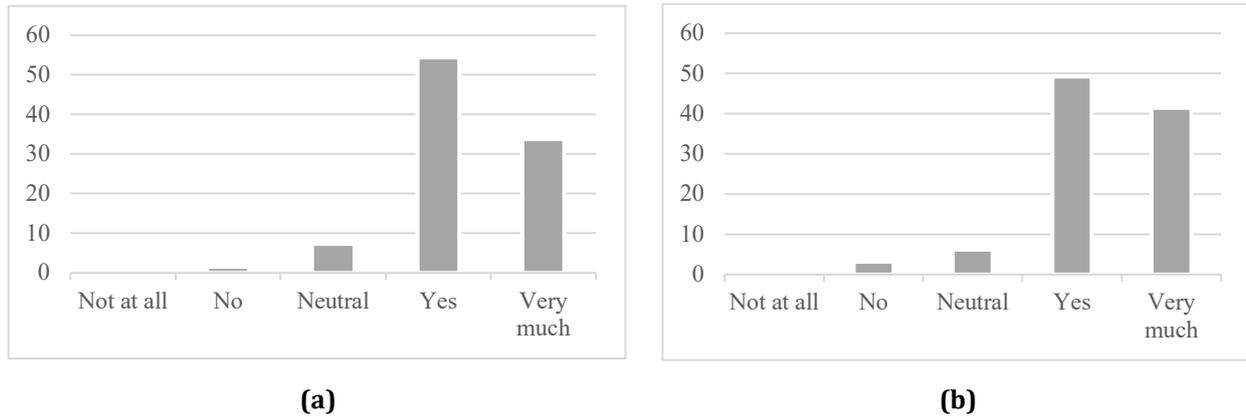
Fig. 7 *Survey results of FTVTI trainers for the practice-oriented curriculum revision (a) Contribution to sustainable development of FTVTI; (b) Contribution to sustainable educational capacity building of trainers*

Fig. 8 presents the evaluation results of FTVTI trainers regarding textbook development conducted to support the revised practice-oriented curricula. 49% of the trainers assessed that textbook development through the KOICA project contributed very much to the sustainable development of FTVTI, while 41.2% stated that it contributed. Additionally, 39.2% of the trainers indicated that their participation in textbook development contributed very much to their educational capacity building, while 56.9% stated that it contributed. In this survey also, most of the trainers responded that through the textbook development process, they had gained the ability to develop new textbooks or improve existing ones, and expressed their willingness to actively participate in the development of new textbooks and the improvement of existing ones in the future. This clearly demonstrates that FTVTI trainers have sufficiently strengthened their textbook development capabilities through participation in the KOICA project's textbook development and that, through their efforts, FTVTI's textbooks will continue to improve, contributing to the institution's sustainable development.
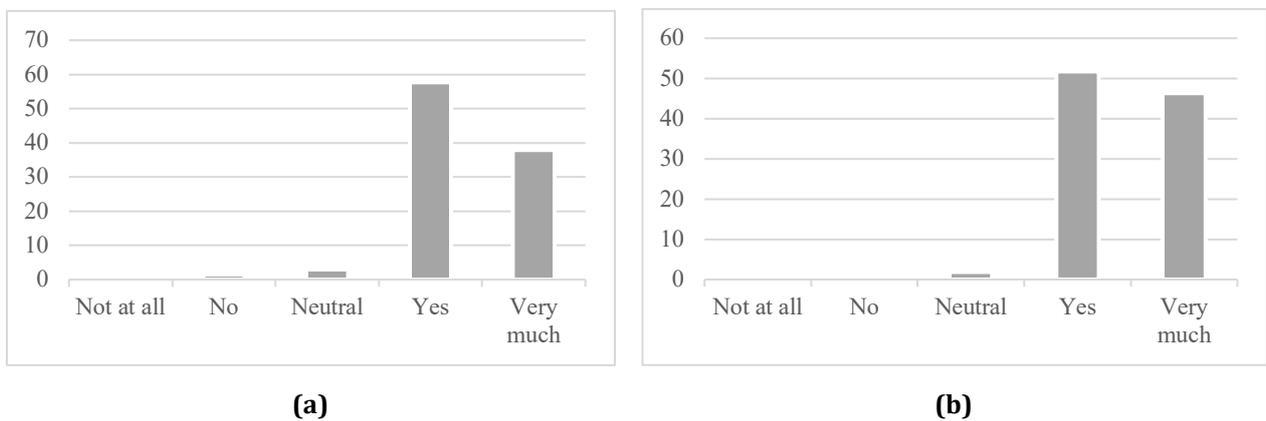

(a)   **(b)**
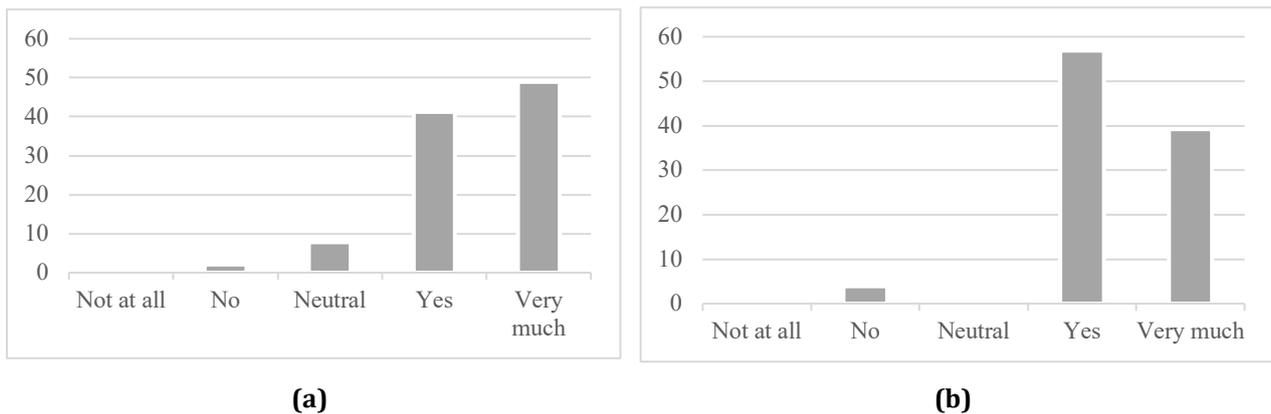
Fig. 8 *Survey results of FTVTI trainers for the textbook development (a) Contribution to sustainable development of FTVTI; (b) Contribution to sustainable educational capacity building of trainers*

As shown in Fig. 9, most FTVTI trainers evaluated that the practice equipment provided for the implementation of practice-oriented curriculum contributed to FTVTI's sustainable development by improving its educational environment. Fig. 10 illustrates that 37.9% of the trainers assessed the equipment-based training provided alongside the practice equipment as having contributed very much to FTVTI's sustainable development, while 57.6% stated that it contributed. In addition, 46.4% of the trainers responded that equipment-based training contributed very much to building their sustainable educational capacity, while 51.8% stated that it contributed. Furthermore, nearly all participants in the same survey reported that they had gained the ability to conduct practical training using the provided equipment. These results show that the provision of equipment and equipment-based training, through the KOICA project, not only played a significant role in improving the

educational environment at FTVTI but also helped enhance the trainers' educational capabilities, particularly their practical training skills, thereby contributing to the sustainable development of FTVTI.

(a)   **(b)**
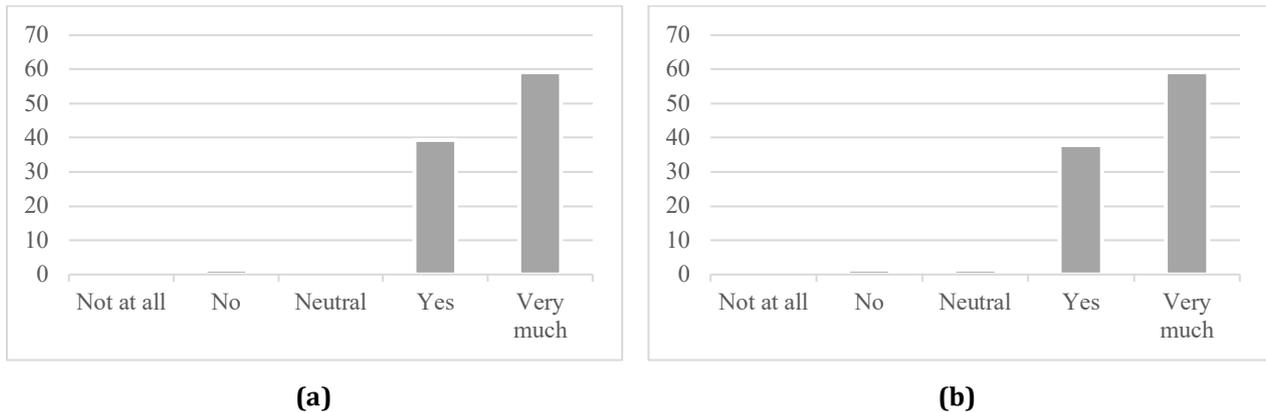
Fig. 9 *Survey results of FTVTI trainers for the practice equipment provision (a) Contribution to educational environment of FTVTI; (b) Contribution to sustainable development of FTVTI*

(a)   **(b)**

Fig. 10 *Survey results of FTVTI trainers for the equipment-based training (a) Contribution to sustainable development of FTVTI; (b) Contribution to sustainable educational capacity building of trainers*

The main goal of implementing the practice-oriented curriculum in the six engineering departments of FTVTI through the KOICA project was not only the sustainable development of FTVTI but also the enhancement of the sustainable educational capabilities of FTVTI trainers. Therefore, curriculum revisions, development of textbooks, provision of practice equipment, and equipment-based training were carried out with the active participation of FTVTI trainers for the implementation of the practice-oriented curriculum. Table 3 summarizes the results of an evaluation conducted by the trainers of the FTVTI six engineering departments who participated in the implementation of the practice-oriented curriculum, showing the extent to which each implementation method contributed to the sustainable development of FTVTI and the sustainable capacity building of the FTVTI trainers.

Table 3 *Summary of the effects of implementation methods for practice-oriented curriculum (5-point scale)*

Method	Contribution to sustainable development of FTVTI	Contribution to sustainable development of Trainers
Curriculum revision	4.21	4.29
Textbook development	4.37	4.31
Equipment provision	4.55	n/a
Equipment-based ractical training	4.32	4.45

Trainers of FTVTI, a federal-level university that trains TVET trainers, play a key role in fostering TVET trainers in Ethiopia, so strengthening the sustainable educational capabilities of FTVTI trainers is crucial for the development of TVET in Ethiopia. As shown in Table 3, FTVTI trainers evaluated that the four methods used in the implementation of the practice-oriented curriculum significantly contributed not only to the sustainable

development of FTVTI but also to the enhancement of the trainers' sustainable educational capabilities. More specifically, FTVTI trainers assessed that the degree of contribution of each method to the development of FTVTI and to their own development as trainers varied somewhat. They evaluated the methods in the following order for their contribution to the sustainable development of FTVTI: equipment provision, textbook development, practical training, and curriculum revision. In terms of the contribution to enhancing their own sustainable educational capabilities, they ranked the methods as follows: practical training, textbook development, and curriculum revision. In any case, the implementation of the practice-oriented curriculum through the KOICA project, as presented in this study, has achieved its intended goal of contributing to the sustainable development of both FTVTI and its trainers, thereby contributing to the development of TVET in Ethiopia.

4.2 Discussion

We closely observed the changes after completing the practice-oriented curriculum implementation activities for the six engineering departments at FTVTI, in order to practically verify the potential for sustainable development of FTVTI and its trainers after the project. The first change could be found in the spread of the practice-oriented curriculum revision activities. In June 2025, FTVTI decided to revise the curricula of all remaining departments into practice-oriented curricula, referring the six engineering departments' practice-oriented curricula—revised with the support of this project—as models, and is currently carrying out the revision work. The curriculum revision applies the curriculum revision manual developed in this project, with trainers from the six engineering departments serving as facilitators. This demonstrates that the significance of the practice-oriented curriculum revision promoted by this ODA project has spread throughout FTVTI, and that the curriculum revision capabilities of the six engineering departments' trainers have improved to the point where they can assist other departments in their curriculum revisions. Through this, we could see that the ODA beneficiary-led curriculum revision approach promoted by this project has provided practical support for the sustainable capacity building of both the beneficiary trainers and the beneficiary institution.

The second change was the active use of textbooks in education. In developing country TVET institutions, the use of textbooks is closely related to trainers' confidence in the textbooks themselves. Even before the textbook development carried out through this project, there were many excellent textbooks related to the subjects taught by the trainers. However, because these textbooks were mostly developed by faculty members in the developed countries to suit the needs of developed country institutions, they were difficult to use effectively in developing country TVET institutions. In fact, as in most developing country TVET institutions, trainers in FTVTI's six engineering departments were conducting classes without fixed textbooks, teaching whatever content they wanted at the time. After trainer-led textbooks were developed through this project, FTVTI trainers were observed actively using the textbooks they had created. They actively distributed their self-developed textbooks to students enrolled in their courses and to students preparing for graduation exams, as well as sharing them with external TVET institutions. This appears to be the result of their confidence and pride in the textbooks they developed themselves. From workshops with the textbook developers, we learned that most of them possessed both confidence and interest in the development of new textbooks and improvement of their existing textbooks.

An important factor in the sustainable development of TVET in developing countries is securing internal capacity to compensate for the lack of financial support. We anticipated that the supply of practice equipment reflecting industry demands, along with sufficient equipment-based practical training for trainers, would strengthen FTVTI's capacity for practical training. We further expected that this enhanced practical training capacity would enable FTVTI to develop industry-academia cooperation activities capable of generating revenue from external industries. In practice, when trainers from FTVTI's six engineering departments visited companies with KOICA experts, they received numerous requests for the repair and maintenance of production equipment, as well as requests to provide technical training for company engineers. Based on the equipment provided through the KOICA project and the practical training skills acquired from participating in training programs of KOICA project, trainers from the six engineering departments at FTVTI are preparing to conduct their own technical training programs for industry engineers. Such technical training activities are expected to readily evolve into paid services, which could, in turn, naturally lead to improvements in FTVTI's educational environment and increased motivation for trainers. As technical training for industry engineers expands, it is anticipated that collaboration for solving technical challenges, joint research, technology transfer, and joint startups will also grow, thereby fostering a virtuous cycle of industry-academia cooperation and ultimately contributing to the sustainable development of TVET.

5. Conclusion

The continuous supply of skilled human resources is essential for sustainable economic development, and for this to happen, TVET must evolve to provide the practical training required by industries. However, many developing countries are unable to effectively respond to the development of TVET due to financial challenges and a lack of experience. This paper explores how ODA can contribute to the development of TVET in developing countries

through the implementation of practice-oriented curriculum. Specifically, this paper focuses on how ODA can contribute to the capacity building of trainers, which is crucial for the development of TVET. Methods used for implementing the practice-oriented curriculum included curriculum revision, textbook development, equipment provision, and equipment-based training. The evaluation conducted after the implementation revealed that trainers who participated in the ODA-driven practice-oriented curriculum implementation found that it significantly contributed not only to the sustainable development of TVET institution but also to the sustainable capacity building of the trainers.

Currently, many international organizations and countries are paying attention to and participating in TVET ODA for developing countries. It is expected that the case introduced in this paper will serve as a good reference model for effectively implementing TVET ODA in the future.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** *Seungchul Park;* **data collection:** *Seungchul Park;* **analysis and interpretation of results:** *Seungchul Park, Hyeseung Park;* **draft manuscript preparation:** *Seungchul Park, Hyeseung Park. All authors reviewed the results and approved the final version of the manuscript.*

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