
Chapter 1 VT Purpose and Role of Concerned Personnel

What are the “results” of vocational training? The purpose of Japan’s public VT is defined by the laws as “to promote the development and improvement of human resourced workers need for their jobs... and thereby to ensure employment security and improvement of the status of workers”. Put simply, the purpose of implementing VT is to help its participant get a job or for workers to receive better treatment. Looking in more detail, we find various types of VT courses in Japan, each of which has different purposes. Each training course is designed for a specific participant group such as unemployed workers and employed workers, and the expected results vary depending on the course. It may be to get a job or solve problems are facing companies, for example. Similarly, expectations on results of a VT course vary depending on the country, region, age and other factors. It is important for the industrial sectors, trainees, labor unions, occupational parties, industrial associations, local governments providing VT, administrative bodies responsible for VT and other concerned personnel involved in VT to have a common understanding on what results each VT should produce.

On the other hand, there are factors that adversely affect improvement of VT results. They may include: only a few local companies employ graduates from VT courses; budget deficit does not allow for the preparation of necessary equipment; basic scholastic achievement of trainees is low; VT instructors do not have enough expertise or training capability; and companies are unable to send their employees to VT. If they continues VT with neglecting these conditions, that does not mean successful VT implementation. It is true that actual VT implementation has challenges but resolving them one by one will come to improve the results of VT.

Carrying the expectations VT concerned personnel, VT instructors are devising ways to resolve various challenges and difficulties in their interaction with trainees. In other words, VT instructors fulfill their roles, feeling the burden of various challenges and difficulties of VT and the contradictions that caused them. In this sense, VT concerned personnel who plan & design, develop and manage VT should simply listen to the voices of VT instructors facing challenges and difficulties and continuously improve VT together with them. VT instructors should also continue to suggest the VT concerned personnel former specific means to overcome challenges and difficulties in VT implementation.

The extent of what VT instructors become involved in VT Planning, Design, Development and Management may vary depending on the country and region. The form of their involvement may change according to the circumstances but people involved in VT concerned personnel and VT instructors should respect each other’s suggestions in a close cooperative relationship and effectively use the limited human resources to enhance the results of VT.

From this perspective, this manual presents, in a systematic manner, various methods necessary for VT instructors and other people involved in VT to enhance the results of VT. We hope that people involved in VT who study the manual ask themselves what results their VT will produce, whether the results of the VT they are pursuing are consistent with the expectations of their country, region and industry, and whether they are devising adequate means to produce the results they desire.

1.1 Purpose of VT

This section describes the perspective underlying the purpose of implementing VT and basic idea of VT.

1.1.1 Abstract definition of VT

If we were to ask individual persons what activities education and training are, we would receive various answers. A scene of education and training involves instructors and learners. Visualizing such a scene, many people may say that they are activities for instructors to teach and for learners to learn and enhance abilities.

Then, what is the purpose of these activities? Answers to this question must greatly vary depending on the respondent. Learners may answer: because it is fun to learn, in order to become XX, to succeed in the world or to help others. Companies putting their employees through education or training may say that their aim is to improve the productivity and motivation or to retain employees in the company. In short, people in various positions expect results according to their respective positions.

To sum up, education and training are “activities to enhance human capabilities to solve problems of society or an organization”. Society and organizations have various problems. Those who answer that they learn because it is fun may have the problem that they would be bored with life without an opportunity to learn. Those who answer that they learn to become XX may have the problem that they would not be able to become XX without learning. Companies wishing to enhance the productivity may have the problem of low employee productivity. They go through or have others go through education or training because they think they can solve these problems by develop human abilities. Society and organizations have various problems but those we aim to solve through VT are limited to those concerning “vocation”.

1.1.2 Problems to solve

Then, what problems do people wish to solve by implementing education and training? Problems of society and organizations are roughly classified into three groups: (1) those of regions including the central and local governments; (2) those of companies or industrial associations, and; (3) those of learners, their parents and other family members. Below are examples of each group. Expectations to solve these problems through education or training constitute training needs:

(1) Problems of regions including local governments

- They desire human resources who can lead and open up new fields in the politics, administration, research and industrial policy of the country to direct the course of the country and regions.
- They desire people of the country and region to be independent and pay tax to maintain the social foundation for social security.
- They wish for people who have left their job, dropped out of school or committed a crime and other people in an unstable state to become independent.

(2) Problems of companies and industrial associations

- They wish to take new field advance, and to conduct research and development to deploy business in the new field.
- They wish to respond to business challenges by introducing new technologies and improving quality and productivity, for example.
- They wish for human resources in various capacities including existing staff, new recruits and mid-career employees to adapt to their workplace and acquire skills for a higher position/job category.
- They wish to maintain a safe workplace and improve the working environment to create a friendly workplace.

(3) Problems of learners, their parents and other family members

- They desire independence of each family member and to build an economically and spiritually rich life.
- They wish to overcome hardship due to old age or poverty.

1.1.3 As a way to solve problems

Problems caused by lack of ability are widely observed in society and organizations. When implementing VT, it is necessary to define which of these problems is to be solved.

The purpose of school education is to provide wide and systematic development of basic and common abilities

necessary to solve various problems. For recipients, the purpose is to learn basic and fundamental matters that can be used in various vocations.

In contrast, VT puts emphasis on acquiring professional skills necessary in their future workplace and it is fairly clear in what VT graduates will work. Graduates are expected to solve problems in their future workplace. As VT is an activity toward problem-solving, it is necessary to define the problem to be solved and design the VT to learn specific ways to solve the problem.

There are means other than education and training to solve the problems of society and organizations. For example, if the quality of products made in a workplace is poor, their quality may be improved by training workers how to produce products of better quality. This is problem-solving by VT, but their quality may be also improved by introducing new machines. If you introduce machines capable of producing higher-quality products, there will be no need to upgrade the workers' skills or implement VT. It is delicate to judge whether to introduce VT to improve human capability or introduce new machines for problem-solving. Therefore, when you choose VT, it is necessary to first define the problem to solve and share the problem among concerned personnel involved. Effective training is possible only when VT is planned and implemented based on problem sharing.

1.2 Environment Surrounding VT

The environment surrounding VT is constantly changing. Because its changes are a factor that produces needs for VT, we sort them to three aspects of industry, people and policy. This section describes three aspects.

1.2.1 Changes in the industry

(1) Change of the industry and technological innovation

For example, houses used to be built with many on-site manual works in Japan; carpenters sawed wood into pieces of decided sizes and planed and joined them using nails. Today, many parts are precut in a plant, delivered to the site and assembled using a crane. The parts are easily and surely joined using nuts, bolts and pneumatic nailing machines. Water resistance and seismic resistance have also steadily improved.

Technological innovation in the field of homebuilding has a great impact on the training of carpenters. For example, it has made manual works using a saw or plane extremely rare in house building sites. Consequently, skills and knowledge to learn through VT has been expanded to use of electric power tools and pneumatic nailing machines.

Furthermore, technical innovation has enabled faster processing of more wood in a factory while maintaining the quality, which has led to cost reduction. Similarly, cost reduction fanned competition among companies in the manufacturing industry including automobile and electric appliances toward Micro Electronics that combines manufacturing system and robots and is suitable for small-rot-multi- production.

(2) Overseas business advance

With rapid appreciation of the yen and the advance of foreign enterprises in Southeast Asia, the advance of Japanese enterprises in Southeast Asia began in earnest in the 1980s. By transferring labor-intensive parts (ex. line production) of manufacturing processes from Japan where labor cost is high to overseas, they sought to reduce cost and ensured their competitiveness in the globalized market. Moving production bases to the huge market of China and Southeast Asian countries that are achieving remarkable economic growth saves the steps of material import and product export and thereby reduces transportation costs.

Overseas business advance generates new needs for VT. For example, the manufacturing industry had to respond to the change from the Japanese Industrial Standards (JIS) to the International Organization for Standardization (ISO). This was a significant change including drawings and working accuracy symbols for workers. VT meets the needs by providing short-term training programs for workers.

The transfer of production bases to low-labor-cost countries and regions near the market diminished production activities in Japan and led to hollowing out of its industry. Transfer of production bases has equally reduced domestic employment. Beyond industrial structure and employment, the phenomenon weakened Japan's technological strength through overseas assignment of skilled engineers for instruction to local employees.

Similarly, ASEAN countries that are heavily dependent on foreign capital and that do not have many domestic companies are concerned that production might be transferred to other countries if their income rises to a certain level.

(3) Changes in industry and VT

As described above, technological innovation that accelerates with time caused changes in the industrial structure and influenced training contents through needs to respond to the changes. As with the concept of the PDCA (plan-do-check-act) cycle that was introduced for smooth operation of production management, quality control and other management works in business activities, a system with a VT management cycle of "plan, implementation, evaluation and improvement" of training was introduced to VT and has been modified to suits VT needs.

1.2.2 Changes in people

(1) Bipolarization of skilled workers

In the past auto industry, a large number of workers worked based on division of labor. But recently introduction of ME (Micro Electronics) gave advanced labor-saving. Most hand works have been replaced by robotic manipulation by operators. In countries with an abundant low-wage labor force, line production by foreign capital has become mainstream rather than expensive plant investment. On an electric appliance manufacturing floor, for example, components flow one after another on conveyers to workers standing less than one meter apart in a narrow space. The process is based on high

division of labor; soldering, tightening screws, assembling and inspection, for example. There is a significant change in manufacturing system.

Bipolarization of skilled workers has progressed in both ME plants manufacturing electronic parts and line production plants that assemble these parts and bodies. There are workers who operate a robot controller as prearranged in ME plants and single skilled workers who need only one skill such as soldering in Line production. On the other hand, response to job changes, troubleshooting and problem-solving require higher-level skilled workers with a complex of skills.

The bipolarization is a visible phenomenon also in VT and has given rise to a VT system of CBT (Competency Based Training) that combines curricula and teaching materials based on competency unit to suit the needs. The system has fewer trainee eligibility conditions such as academic qualifications and can be implemented in a short period of time. For high technologies, a Mechatronics training course was set up combining the existing machine training course and the electrical and electronic training course. This is a long-term course for two years or more designed for trainees with learning equivalent to high school graduation.

(2) Changes in employment practice

Lifetime employment had been established as an employment custom in Japan. Employees learned skills and the way of working in one company over a long period of employment. The system created a working culture in which a company is united as a family, employers protect their employees and employees serve their company.

The custom provided the security of lifetime employment and stability of food, clothing and housing. On the other hand, employees had to accept pay cuts in a time of recession and brutal unpaid overtime.

Working long hours not only damages the mental and physical health of workers, but also harms their relationships with their family and community. It has become important to balance work and personal life. Importance of the work-life balance to think about the way of working come to be demanded to control the tragedy which the imbalance of work and private life that were a cause of stressful society.

Furthermore, lifetime employment with a large number of regular employees is a heavy burden on companies in a time of recession. As a result, the system of employment adopted by companies has greatly changed. It is now conventionalized to employ workers for single-skill jobs as temporary worker, part-time contract worker and other types of non-regular employees.

(3) Employment form of non-regular employees

Non-regular employment has been expanding year by year and generated various forms of employment as shown below:

① Dispatched worker

Based on an employment contract between a worker and a worker-dispatching undertaking, the undertaking dispatches the worker to a company with which the undertaking signed a worker dispatch contract and the worker works under the command of the company. This is a complicated labor form in which the company paying wages to the worker is different from the company issuing commands.

② Contract workers

Unlike regular workers, contract workers have their employment periods specified in their labor contract. Such labor contracts stipulate a contract period based on the agreement of the worker and the employer and automatically expire at their expiration.

③ Part-time worker

Workers whose scheduled working hours are shorter than those of regular employees of the same place of business are called part-time workers. Workers who are called differently such as part-timers and moonlighters are all part-time workers as defined in the Act on Improvement, etc. of Employment Management for Part-Time Workers as long as they meet the condition.

④ Outsourcing

Regular employees as well as “dispatched workers, part-time workers and part-time staff” described above are under the protection of labor act as “worker”. However, because people working based on “subcontracting” or “contract for work” are paid for completing a task given by the outsourcer, they are treated as a “business operator (employer)” who is not under the command of the outsourcer and therefore not under protection as “worker” in principle.

As described above, with changes in industry caused by technological innovation, ways of working and employment system have changed significantly and the number of non-regular workers is increasing year by year (see Figure 1-1).

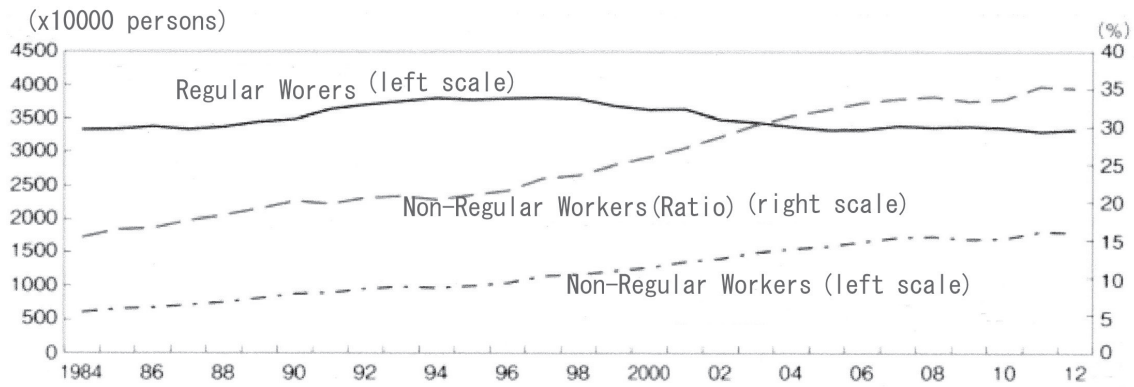


Figure 1-1 Changes in the Number of Regular and Non-Regular Workers

(Source: Changes in Number of Regular and Non-regular Workers on P.120 of Analysis of Labour Economy 2012 by Ministry of Health, Labour and Welfare)

(4) Current state of the right to work and career decision

We have the right to work in the profession of our choosing. In principle, we have the right to choose our vocation and way of working. Our school education and VT systems provide various opportunities to guarantee the right.

However, we must win competitions to advance to the desired school, get a position in the desired company and realize the desired way of working. They are significant hurdles apart from the right.

People in poverty or under armed conflict are even deprived of the right. VT is contributing to poverty reduction, reconstruction after armed conflict and reintegration of ex-combatants in developing countries in Southeast Asia and Africa. VT instructors are professionals of great pride directly supporting individuals in getting the job they desire.

1.2.3 Changes in policy

(1) Changes in VT policy

The years from 1954 to 1973 are considered to be the period when the Japanese economy grew dramatically. Ten years after the World War II, it coincides with the period of the entry into employment of a large number of young people who were born during the baby boom (see Figure 1-2).

It is believed that the term “vocational training” has been used in Japan since the enactment of the Vocational Training Act in 1958.

The act gave birth to long-term VT for skilled workers that is equivalent to school education for junior high school graduates. This VT policy helped move an abundant young workforce in rural areas to industrial areas across the nation while functioning as a provider of higher education that was in shortage. At the same time, VT, operated all over the country, established and spread the VT Standard, Trade Skill Test and other systems ensuring uniform quality.

Later, based on the high economic growth and rapid technological innovation in Japan, demand for skill up-grading VT for workers and career-change VT for jobless workers expanded, leading to the enactment of a new Vocational Training Act in 1969.

After this, a legal reform was conducted in 1985



Figure 1-2 Population Pyramid

(Source: Home page of Statistics Bureau of Ministry of Internal Affairs and Communications, http://www.stat.go.jp/data/kokusei/2010/kouhou/useful/u01_z19.htm)

(Human Resources Development Promotion Act), 1992, 1997, 2001 and 2006 to support employers in ability development of workers, enhancement of advanced VT, etc. in accordance with the industrial and employment situation of the time.

(2) Trade Skill Test System

The National Trade Skill Test system, certified by the government, tests the technical skills and knowledge of working people according to uniform standards. Since the system was implemented in 1959 based on the Vocational Training Act with the aim of enhancing social estimation of skills and knowledge and improving the skills and status of workers, the Trade Skill Test has been enriched in its content every year and implemented for 114 occupations as of April 2013. The number of people who passed the Trade Skill Test exceeded 3.59 million in FY2011. The test is highly valued as proof of reliable skill in the workplace (excerpt from the website of Japan Vocational Ability Development Association).

(3) Employment balance and education/training

It is desirable for manufacturing companies to employ university graduates, technicians who have completed high-level VT such as a Mechatronics course, operators who have completed short-term training to work on the front line of production and other workers in a good balance.

However, the progress of decline of the birth rate in Japan is intensifying the competition to recruit students among universities to ensure stable management (see Figure 1-3). To this purpose, universities and the government have improved scholarship programs accelerating popularization of higher education. On the other hand, fewer young people are receiving high-level VT.

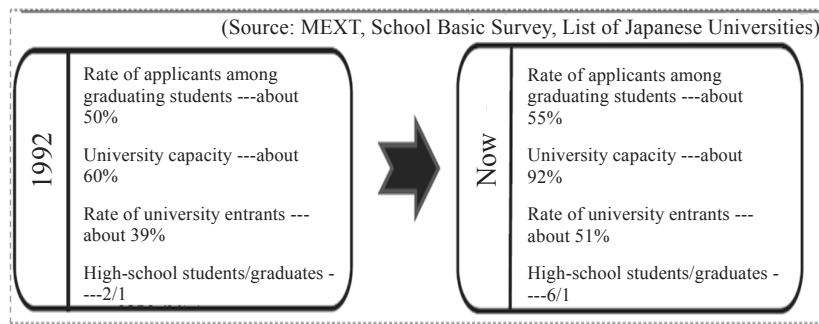


Figure 1-3 Current State of Universities

Moreover, reflecting the shift away from blue-collar occupations that have an image of “hard, dirty and dangerous” jobs and the rising rate of advancement to high school, long-term VT courses for skilled workers targeting junior-high school graduates are experiencing a serious shortage of trainees. VT is different from common university education. University students learn a wealth of knowledge and theories through lectures and experiments. On the other hand, trainees acquire many skills through VT that is said to consist of 80% practice and 20% lecture.

In response to companies’ demand for well-balanced training services, VT also provides short-term upgrading VT for higher-educated employees and opportunities to acquire skills necessary for high-level skilled workers. Short-term VT and operator training may be provided also to housewives who have finished raising children and the retired senior generation.

(4) Employment promotion

One of the big features of VT in Japan is that it not only provides training but also has a goal defined as the placement performance index or employment rate. The goal is not set by the government but by the training providers themselves (ex. 80% employment rate three months after completing the training). This is because the cost of VT operated based on a national policy is paid from employment insurance money (national treasury). Operation of VT involves great expenses including payroll of instructors, equipment investment, material cost and payment for utilities. Recognizing as VT results (1) contribution to local industry and economic development and (2) response to the wishes of companies and individuals, the employment rate is chosen as the performance index.

To reach the goal of employment rate improvement, universities under the Ministry of Education, Culture, Sports, Science and Technology, Japan also started to put effort into placement assistance by setting up career support centers, for example. VT introduce various methods and systems to develop human resources with higher practical skills. For example,

an internship that has been used by medical and education departments and in nursing education has become common as dual-system training also in VT. Training methods and ways of learning have also become diverse to include PBL (Project Based Learning or Problem Based Learning) for a small number of people to solve actual problems or challenges and distance learning using the Internet.

Meanwhile, VT strategy across borders has become important for ASEAN (Association of Southeast Asian Nations), established in 1967, that has now 10 member countries. In particular, labor mobility in the Greater Mekong Sub-region (GMS) is a prominent example. It is important to have a strategy for human resource development that meets the needs of trans-border labor mobility. The history of Japanese VT policy that changed the system to meet the needs of industry and employment and provided support through system construction may serve as useful reference for formulation of such a strategy.

1.2.4 Summary

VT in Japan has changed its course to VT for unemployed workers and job transfers, VT for junior high school leavers, up-grading VT for worker, etc. in response to the changing situations of industry and employment based on the national policy.

It draws attention that instructors with broad experience in training instruction have been actively involved in the changes in training course.

Instructors participate not only in preparation of classes, teaching and evaluation, but also in operation of training on a daily basis including survey of employment needs in the labor market, development of training plans and training materials and follow-up after training. This experience is the driving force to build new training course based on the changing national policy.

For human resource development through VT in ASEAN countries, too, the existence of instructors who understand how to turn the PDCA of VT operation may become an important key to success.

1.3 Laws and Practice of VT

This section describes how VT is regulated by laws and practiced in Japan.

1.3.1 Provisions of laws

The Human Resources Development Promotion Act (“the Law”) specifies that public VT in Japan shall be implemented together with the Employment Countermeasures Act. The Law specifies the basic principle, responsibilities of persons concerned, purpose and formulation of a Basic Plan for Human Resources Development, promotion of human resource development (ex. ensuring various opportunities for human resources development, systematic promotion of human resources development, appointment of a human resources development promoter), implementation of public VT by the State and Prefectures (human resource development institutions, VT standard, training materials, trade skill verification, accredited vocational training, Polytechnic Universities, vocational training instructors), Vocational Ability Development Associations (trade skill tests) and other matters.

Public VT provided by the State based on the Law shall be implemented by the Japan Organization for Employment of the Elderly, Persons with Disabilities and Job Seekers (JEED). Operating expense, etc. of public VT is paid from contribution by employers to employment insurance. Some public VT operated by Prefectures is subsidized by the State and some are implemented on the Prefecture’s own budget.

Concerned personnel implementing VT must understand that the Law specifies the budget, facility, equipment, training course/training objective, number of trainees and instructors and other matters relating to VT implementation.

1.3.2 Legal structure

The general framework of Japan’s VT system is provided by the Law and its details are specified by the Ordinance of the Human Resources Development Promotion Act (the Ministry of Health, Labour and Welfare Ordinance) and Appended Tables 2 (ordinary VT), 6 (advanced VT of specialty course), 7 (advanced VT of applied course) and 8 (long-term VT instructor training) that are details of the VT standard.

Based on the VT standard (Appended Tables), the Ministry of Health, Labour and Welfare defined details of training subjects and details of facility & equipment through the Circular Notice of Director-General the Bureau and published the Guideline for Curriculum Design.

1.3.3 Content of provisions

(1) Training structure

Public VT is categorized into Ordinary VT and Advanced VT based on the training target level, and into long-term courses and short-term courses based on the duration (see Table 1-1).

Table 1-1 Classification of Public VT

	Long-term		Short-term		Implementing institution
	Course	Duration	Course	Duration	
Ordinary VT	Ordinary course (Appended Table 2)	One year for high-school graduates Two years for junior-high-school graduates	Short-term course	12 hours to 6 months	Polytechnic school
Advanced VT	Specialty course (Appended Table6)	Two years for high-school graduates	Short-term specialty course	12 hours to 6 months	Polytechnic College
	Applied course (Appended Table7)	Two years for specialty course graduates	Short-term applied course	60 hours to one year	
Instructor training	Long-term course (Appended Table 8)	Four years for high-school graduates	—		Polytechnic University
	Master course	Two years for long-term course graduates	—		

(2) VT Standard

Public VT should be implemented with conforming to the Law. The Law specifies training objectives, duration, subjects, facility & equipment, etc. in order to guarantee the quality of training.

The key feature of the Japanese VT Standard is that a minimum standard is set to guarantee the quality of training while granting discretionary to VT institutions. The VT Standard specifies only about 60 percent of the entire training hours. Selection of subjects, selection and installation of necessary equipment, etc. for the remaining 40% are left up to the discretion of the VT institution. VT institutions have the responsibility to design and implement VT courses by taking local VT needs into consideration.

As examples, the details of training subjects and equipment of Production Technology, a specialty course of Advanced VT, are shown in Tables 1-2 and 1-3, respectively; details of the trade skill verification standard that is also a training objective are shown in Table 1-4.

The details of a training subject include the subject title and training hours; the example in Table 1-2 specifies 350 hours for “basic theory for course group”, 215 hours for “basic practice for course group”, “specialized theory” and 610 hours for “specialized practice”, 1,525 hours in total. They account for 55% of the total training hours (2800 hours) for two years. For the remaining 1,275 hours, training subjects are decided at the discretion of the VT institution.

Table 1-2 Details of Training Subject of Production Technology Course (excerpt)

Training course		Mechanical System Group Production Technology		
Training subjects		Training hours	Details of the training subject	
Basic theory	1	Introduction of control engineering	35	Classic control theory, basic theory of control engineering, -omitted-, design of control system, basic theory of contact/noncontact sequence, digital control
	2	Overview of electrical engineering	35	Basic theory of electrical engineering, DC circuit, property of electric resistance, thermal action of electric current, magnetism and magnetic field, electric current and magnetic field, AC circuit
	3	Overview of information engineering	35	Omitted
	4	Materials engineering	35	Omitted
	5	Dynamics	70	Omitted
	6	Basic drawing	70	Basics of drawing, representation of figures, method of dimensioning, dimensional tolerance and fitting, surface quality, geometrical tolerance, material marks and various graphic symbols
	7	Production engineering	35	
	8	Safety and health engineering	35	Safety regulations, safety standards, sanitary supervision, -omitted-, standard operation, safety check, protective equipment, risk prediction
			350	
Basic practice	1	Basic engineering experiment	80	Basics of measurement, tension test, hardness test, -omitted-, experiment of strength of materials, mechanics experiment, hydrodynamics experiment, thermodynamics experiment, industrial material experiment
	2	Basic electric engineering experiment	35	Omitted
	3	Data processing practice	65	Omitted
	4	Safety and health working method	35	Prevention of disasters involving machines, raw materials, etc., safety devices, handling of protective equipment, electrical safety work, first aid
			215	
Specialized theory	1	Kinematics of machinery	35	Motion of mechanism, link mechanism, cam mechanism, gear mechanism, -omitted-, spring, screw mechanism, balance of forces, various mechanisms
	2	Machine work technology	70	Articulated system, various machine tools, machining, plastic working, special machining, plastic mold, cutting theory, cutting tools
	3	Numerical control	70	Omitted
	4	Hydraulic/pneumatic control	35	Omitted
	5	Sequential control	35	Logic circuit, sensor actuator, how to read and draw sequence diagram, basic circuit
	6	Measuring method	35	Omitted
	7	Mechanical design and drawing	70	Omitted
			350	

Specialized practice	1	Machining practice	250	Machining work experiment, -omitted-, lathe, milling machine, programming, NC machine operation, numerical control machining practice
	2	Control engineering practice	110	Functional property of hydraulic/pneumatic equipment, disassembling and assembling hydraulic/pneumatic equipment, basic circuit assembling -omitted-, hydraulic/pneumatic sequence experiment
	3	Measuring practice	35	Omitted
	4	Design and drawing practice	215	Computer graphics, basic operation of CAD system, -omitted-, demand analysis, technology forecasting and product planning, form design, production design
			610	

Details of equipment shown in Table 1-3 specify minimum equipment, appliances, machines and tools necessary for implementing the details of the training subject shown in Table 1-2. VT institutions are required to select and install equipment, machines, tools, etc. necessary to implement training subjects for remaining 1,275 hours (40%) that are not specified in the details of the training subject.

Table 1-3 Details of Equipment of Production Technology Course (excerpt)

Class	Name	Remarks	Quantity			
			For a group of 20 trainees		For a group of 40 trainees	
Building and other	Classroom		50	m ²	100	m ²
	Workshop		950	m ²	1,150	m ²
	Laboratory	For basic experiment on fundamental engineering, mechanical engineering, electrical and electronic engineering and control engineering	460	m ²	460	m ²
	Hazardous material storage warehouse	Meet the requirements of the Fire Service Act	30	m ²	30	m ²
Machine	Lathe	Center-to-center dimension: 500~1,000mm	10	Unit	20	Unit
	NC lathe	Center-to-center dimension: 300~600mm	1	Unit	1	Unit
	Universal milling machine	No. 2	1	Unit	2	Unit
	Machining center	Including small presetter	1	Unit	1	Unit
	Mechanical engineering experiment equipment	For material testing machine, machining testing machine, precise measurement and heat treatment	1	Set	1	Set
	Electrical and electronic engineering experiment equipment	Digital multi meter, oscillator, oscilloscope, FFT analyzer	1	Set	1	Set
	Sequence control experiment equipment	Contact and logic	1	Set	1	Set

1.3 Laws and Practice of VT

Other	Tools for work		Required quantity	Required quantity
	Measurement equipment		Required quantity	Required quantity
	Drawing instrument and drafting tools		Required quantity	Required quantity
	Software, models, etc.		Required quantity	Required quantity

The details of the trade skill verification standard shown in Table 1-4 specify skills acquisition which is to be verified in the Trade Skill Verification implemented after completing the training. It shows training objective by stating that each trainee should know about XX and has capable of doing YY at the end of the two-year training course. The details of the training subject and equipment are set to achieve the training objective.

Needless to say that the skills to be acquired by the time of completion include skills to be learned through the training subjects for the remaining 1,275 hours (40%) that are not specified in the details of the training subject.

Table 1-4 Production Technology Course: details of trade skill verification standard

Theory			Practice		
Basic	1	Know about mechanical dynamics, strength of materials, fluid dynamics and thermodynamics	Basic	1	Capable of conducting foundation engineering and mechanical engineering experiments concerning mechanical dynamics, strength of materials, fluid dynamics, thermodynamics and industrial materials
	2	Know about properties of metallic materials, high polymer materials and materials for electrical/electronic components		2	Capable of conducting basic experiments in electrical engineering using various types of electrical measurement equipment, measuring instrument, testing machine, etc.
	3	Know about basic drafting of machines		3	Capable of doing basic data processing practice
	4	Know about electrical theories and machinery			
	5	Know about basic theories of control engineering and characteristics of control system			
	6	Know about basic configuration and peripherals of computers, programming languages, hardware and software			
	7	Know about production engineering			
	8	Know well about safety and health			
Specialize	1	Know well about machine elements	Specialize	1	Well capable of operating and adjusting machine tools
	2	Know well about types of machines and motion of mechanisms		2	Well capable of machining
	3	Know well about types of machine tools, cutting theory and machining		3	Capable of doing cut processing and grinding experiments
	4	Know well about outline of NC, NC controller and NC programming		4	Well capable of doing programming for NC machining
	5	Know about hydraulic and pneumatic control		5	Capable of disassembling and assembling hydraulic and pneumatic equipment & tools

	6	Know about sequence control		6	Capable of designing circuits of hydraulic and pneumatic equipment & tools
	7	Know well about measurement and examination methods		7	Capable of doing sequence control
	8	Know well about mechanical drawing and design		8	Well capable of handling and adjusting measuring instruments and testing machines
				9	Well capable of doing measurements, tests and inspections
				10	Capable of designing and drafting machines, machine parts, etc.
				11	Well capable of doing computer graphics using CAD/CAM and basic operation of solid modeling

(3) Review of VT Standard

In order to guarantee the quality of public VT, the Ministry of Health, Labour and Welfare is reviewing the VT Standard itself. The review is being made to ensure the consistency of the current VT standard with industrial technology trends, human resource development by companies and other factors.

The ministry considers the content of the review at its own committee and asks JEED to submit basic information for this purpose. JEED holds committee meetings inviting VT instructors as members from VT institutions and reviewing the VT standard.

Public VT institutions implement VT courses with minimum training subjects specified in the VT Standard and other subjects selected based on the local VT needs. VT instructors play a part in development and implementation of VT courses.

JEED can contribute to the review of the VT Standard because VT instructors are playing a part in the PDCA cycle by engaging in planning, design, development, implementation, trainee support and management of VT courses.

(4) Training material

To implement public VT and guarantee its quality, it must use training materials of a certain quality. For this purpose, the Law specifies that “In the course of ordinary or advanced vocational training provided at public human resources development institutions shall endeavor to use text books or other teaching and training materials accredited by the Minister of Health, Labour and Welfare”.

(5) Trade skill verification

Public VT in Japan is implemented integrating human resource development and ability evaluation as a unit. The Law defines that “the director of VT institution shall conduct the verification of trade skills (named “trade skill verification”) and knowledge thereon for persons who receive public VT (limited to long-term training courses)” and that “A person who has successfully passed trade skill verification may refer to him/herself as a certified junior skilled worker”.

This is proof that a certain vocational ability has been developed through public VT. Trainees who have passed trade skill verification qualify to take a trade skill test. This is an example of the integral operation of VT and vocationally ability evaluation.

(6) VT instructors

It is also characteristic to Japan’s public VT that the state (1) requires qualification for VT instructors and (2) specifies the number of VT instructors to be assigned to VT institutions as means to implement public VT and guarantee its quality.

The Law defines that persons in charge of ordinary VT (excluding short-term training courses) implemented by a public VT institution shall hold a VT instructor’s license in the relevant job category (there are supplementary provisions such as an exception for persons having certain qualifications) and that a proper number of VT instructors shall be assigned to each training course of ordinary VT considering the number of trainees.

There are various ways to obtain a VT instructor’s license but the favored ways are to complete a VT instructor training course of the Polytechnic University or take a VT instructor license examination after a certain amount of working experience.

1.3.4 Laws and division of roles in practice

JEED implements advanced and ordinary VT at the Polytechnic University and the Polytechnic Center, while prefectures have Polytechnic schools to implement ordinary VT (some of them have a polytechnic junior college also implementing advanced VT).

Having the responsibility to develop human resources that the state and regions need, JEED is required to ensure broad-based implementation. For this purpose, in addition to the minimum training subjects specified in the VT Standard, JEED has developed a standard curriculum of classes for all training course (see Table 1-5). VT institutions are allowed to make changes not exceeding 20% of the total training hours considering the local VT needs. Changes exceeding 20% require the approval of JEED Headquarters. Members of the standard curriculum committee set up by the headquarters are VT instructors.

Table 1-5 Standard Curriculums

Course name	Production technology course	Category	Specialized practice
Course subject	Machining practice		
Class subject	Machining experiment	Credit	4
Training objective	Conduct various machining experiments to learn skills to judge proper conditions, etc.		
Detail of class subject	Content of class subject	Training hours	
1. Cutting resistance experiment	(1) Method for measuring machining resistance (2) Measurement of specific resistance of various work materials (3) Measurement of three force components (4) Measurement of cutting resistance under various conditions (5) Summary	24 H	
2. Power experiment	(1) Mechanical efficiency (2) Measurement of net power (3) Measurement of power under various conditions (4) Summary	16 H	
3. Measurement of surface roughness	(1) Measurement of surface roughness using tools of varying nose radius (2) Measurement of surface roughness under various conditions (3) Summary	16 H	
4. Cutting chip processing	(1) Shapes and configuration evaluation of chips (2) Different shapes/configurations of chips depending on the type of chip breaker (3) Shapes and configurations of chips under various feed conditions (4) Summary	16 H	
		Total: 72 H	
Machines and Tools	Tool dynamometer, lathe, wattmeter, surface roughness measurer, profile projector, image measurement device		

1.3.5 Training evaluation

Results of Public VT provided by the State through JEED are evaluated by evaluation organizations established by the State. It goes without saying that low evaluation leads to advice concerning implementation. Evaluation is made on efficiency improvement of business operations, efforts to enhance the quality of services, effective operation of VT institutions and other matters. Course fill rates and trainee employment rates are also subject to evaluation for up-grading VT for workers, VT for unemployed workers and VT for high level skilled workers and other courses.

Each VT institution sets up a management meeting consisting of experts, concerned bodies, companies that will employ graduates and other related parties to hear their opinions on implementing policy, organization, courses provided, past implementation, etc. and confirm local VT needs. The management meeting evaluates VT courses, while VT instructors conduct employer satisfaction and trainee proficiency level surveys. Of course, evaluation information is shared by all staff members of the institution.

Evaluation results are fed back to the planning stage at the State, VT institution and VT course levels and reflected in the respective plans.

1.4 Functions for VT Implementation

Purposes of VT are described in detail in 1.1. There are a large number of vocations and workers. Workers are required to have ability necessary to fulfill their duty at their workplace. Required job performance skills are constantly changing as a result of technological innovation and other factors. Some can acquire necessary skills on their own whereas some may learn from people around them. Japan's VT is planned and implemented for people who wish to acquire job performance skills in manufacturing fields. It is their pride and pleasure for VT instructors to transfer their abilities in practice and theory to trainees and observe them change and grow by acquiring skills, coming to understand subjects and gaining self-confidence in work through VT. Functions necessary for adequate implementation of VT that VT instructors can be proud of will be described below.

1.4.1 Analysis & planning

Analysis and planning are functions taken by VT concerned personnel when establishing or revising VT courses.

Various problems in the environment surrounding VT including industry and factories are surveyed and analyzed to clarify VT needs. Based on the VT needs, planning identifies the VT course that can solve the problem. Thus, analysis and planning are functions to clarify VT needs and the outline of the VT course including the outcome objective and attainment objective.

Recently, residential solar systems have started to spread, but there are various problems in installation work for this non-conventional system. As a result of analysis & planning of the case, a new VT course was set up in the Architecture field (See Table 1-6).

Table 1-6 Example of Outline of a New VT Course

Course	Photovoltaic system installation
VT needs	Shortage of solar system workers, a high incidence of rain leaking due to poor work, incorrect electric wiring, etc.
Training purpose	Promote residential solar system installation and improvement of work quality through VT
Outcome objective	Train workers capable of installation work of solar systems for conventional homes
Attainment objective	<ul style="list-style-type: none"> •Capable of installing solar system •Capable of executing correct waterproofing on roof •Capable of executing correct electrical wiring

1.4.2 Design

Design is a function taken by VT personnel to decide the detailed content of a VT course (curriculum development).

Based on the outline (ex. purpose, attainment objective and outcome objective of the new VT course set up as a result of analysis & planning) the composition of subjects (unit of instruction), the target level and items of each subject, training hours, etc. are designed.

First, subject design, total training hours, time table and other matters are decided. Next, the target level, items, training hours, etc. are decided for each subject. Table 1-7 is the curriculum of "solar system installation" described above.

1.4.3 Development

Development is a function taken by VT concerned personnel at the preparatory phase of a VT course. Based on the result of design (curriculum), a specific training method is devised and necessary training materials, equipment, etc. are selected and created.

Specifically, the items below and all tools necessary to implement the VT are prepared or newly created as needed.

- Preparation of VT environment such as classroom (including desks, projectors and other machines, tools and raw materials) and workshop (including machines, tools and raw materials)
- Development and preparation of practice assignment (assignment, instruction sheet for assignment, drawing)
- Selection or creation of text
- Creation of presentation materials (ex. supplementary materials, PPT)
- Development of a VT implementation plan (ex. VT schedule, lesson plans)

Table 1-7 Curriculum Example

Unit	Photovoltaic system installation	Class number	***	
Attainment Level	(1) Basic knowledge of photovoltaic system			
	(2) Basic knowledge of roof waterproofing installation method			
	(3) Capable of installing photovoltaic system			
	(4) Knowledge of important points for installation in special regions			
	(5) Capable of safety and health work			
Details of training subject	Content		Training hours	
			Theory	Practice
Basic knowledge of photovoltaic system	(1) What is a photovoltaic system? (2) Types and purpose of use of system components (ex. solar cell module, connection box, power conditioner) (3) Omitted (4) Omitted (5) Calculation of expected annual power generation		3	
Basic knowledge of roof waterproofing installation method	(1) Structure, shape and material of roof (2) Types and structure of roof waterproofing installation method		3	
Photovoltaic system installation	(1) Installation of solar cell module (2) Installation of system components (ex. connection box, power conditioner) (3) Omitted (4) Omitted (5) Omitted		2	10
Safety and health	(1) Safety in general (2) Keep in order			
			8	10
Machines, tools, etc. to use	A photovoltaic system set of tools and a set of measuring instruments			
Remarks				

Those who develop a VT course by preparing the items above are required to correctly understand the targeting capability of trainees (attainment objective) and cautiously make preparations considering trainees readiness and comprehension. Lesson plans (Table 1-8) are developed with the aim of achieving maximum training results with limited hours, budget and equipment. A lesson plan is developed reflecting all matters to consider at the development phase training target, place, machines, tools, raw materials, training materials, training steps, teaching method, training assignments, etc. Consequently, development of a lesson plan also has a function to check items to be prepared at the development phase of a VT course.

Table 1-8 Example of Practice Lesson Plan (filing)

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Practice Lesson Plan			
<p>1. Title: Filing</p> <p>2. Purpose: Using each tool correctly results in efficient manufacturing of high-quality products. The practice should be the basis for acquiring this skill.</p> <p>3. Objective: Capable of assembling and removing the file and hand grip. Capable of securely affixing the processed goods without damaging them using a vice. Capable of implementing filing work in the right posture. Capable of judging filing performance. Capable of evaluating the filed workpiece.</p> <p>4. Training item: (i) Handling of the file, (ii) how to affix the processed goods, (iii) posture of filing, (iv) good filing evaluation method, (v) evaluation of filed workpiece</p> <p>5. Readiness: Can implement 4S. Can use protective gear (eyeglasses, gloves, protective footwear).</p> <p>6. Timing: First week, the first lesson of Machine Processing Practice Course.</p> <p>7. Number of trainees: 20</p> <p>8. Place: Machining workshop</p> <p>9. Time required: 6 hours</p> <p>10. Training materials, etc.: Training assignment No., vices, dolly blocks, files, hand grips, brass bars (φ40×200mm)</p>			
Instruction step	Instruction items and the method of development		Duration
Introduction	Ask trainees in the situations in which manual filing is conducted →in mold making, etc. Let them guess its handling range based on the kinds of material and hardness. Instruct them that they will refashion a round bar into a square bar in six hours. Tell them to use a file correctly because they can produce good products efficiently by correct use of tools.		3 minutes
Procedure	Presentation	Training assignment No.X (1) Fitting and detaching of file to and from its grip -Match the size of the file to the size of the grip Be careful not to let the file spring when detaching it.	2 minutes
	Application	Let trainees repeat fitting and detaching a few times and finally fit the file securely.	5 minutes
	Presentation	(2) Chuck of workpiece -Have them carefully handle the vice handle -Show them that gripping with a vice can scratch the workpiece and that this is prevented by using protect jigs	5 minutes
	Application	Let them grip a workpiece in a vice.	2 minutes
	Presentation	(3) Filing work -How to hold a file -Show the position of feet and elbows and movement of the upper body (how to use legs)	5 minutes
	Application	While having them file one side of a brass rod, check the following as you walk in the workshop: Is the file surely fitted to the grip? Is the workpiece surely gripped in a vice? Is the handle of the vice correctly placed; are they holding the file correctly? Is their posture right When they have learned to file, give them cues to file 30 to 40 times a minute.	20 minutes
Summary	Presentation	Ask them what was difficult in the work. → Show a knack. Show them that power adjustment to cut flat is difficult. Show a good way to exercise. Show that power adjustment varies depending on the type of workpiece and the file. Show that they can make good products efficiently by using tools correctly.	10 minutes

(Source: Figure 2-37 An example of practice lesson plan on P.121 of the 10th revised edition of “Theory and Practice of Vocational Training” edited by General Incorporated Foundation, the Vocational Training Materials Research Center)

1.4.4 Implementation

Implementation is a function taken by VT instructor to implement VT course at a workshop, etc. so that trainees can achieve their training objective.

The major premise for the implementer to fulfill the role is to be capable to execute the skills that are the objective of the training. Basic-level capability is not enough to provide adequate instruction at a high skill level. As sometimes observed in developing countries, instructors are not able to help trainees achieve their attainment objective partly because their skill level is lower than the attainment objective. They cannot train trainees because of their inability to provide practice training. Improving the skill level of instructors is a prerequisite for the management of training quality.

In order to fulfill the function of training implementation after the setting of a VT course based on the development function, it is required to fulfill the following:

(1) Preparation

Make advance preparation to ensure smooth implementation of VT based on the developed training schedule and lesson plan.

Check beforehand the developed lesson plan, the availability and safety of the classroom/workshop and the machines, tools & raw materials for practice in the workshop, and whether the necessary quantity of handouts for trainees and tools are secured, for example, in preparation for the training.

(2) Implementation

Actual training is implemented according to the lesson plan while considering the integration of theory and practice training as well as relations with other subjects. In order to ensure safety, implementation includes safety instruction actively employing inspection using the Prior-to-Use Check List, introduction of specific accident examples due to physical/human causes, danger prediction training and near miss reports. Attention is paid also to the working clothes, safety shoes and other conditions of the trainees. For safe execution of training, KYT (danger prediction training) trainer training is provided as an effort to eliminate accidents.

If, unfortunately, an accident occurs, proper steps including first aid, reporting and transportation should be taken. You will also have the task of analyzing the equipment, human factor, operational and management factors of the accident in order to make a recurrence prevention plan.

If training is not being implemented as intended in the lesson plan, it has two possible causes. One is a problem in the lesson plan and the other is insufficient training capability of the instructor. In the latter case, it would be necessary to improve the method of explanation, training material, assignment presentation, etc. based on the opinions of others, which may include observation of the classes and teaching methods and guidance by colleagues and others.

(3) Evaluation

Evaluation is the function to check whether trainees have achieved the training target of each subject. For this purpose, trainee self-evaluation and target level evaluation are conducted. Trainee self-evaluation is conducted by trainees' checking their own achievement of the attainment objective, whereas their target level evaluation is conducted using training assignment, etc. at a training stage that is deemed adequate for the purpose of implementation.

(4) Improvement suggestions

Suggestions to improve lesson plans (ex. method of explanation, practice training, presentation of training material, supplementary materials, training assignment) are made based on trainee self-evaluation, target level evaluation and observation of trainees' acquisition situation. Playing a part in PDCA cycle management by making improvement suggestions is an important role because suggestions may involve not only lesson plans but also planning, design and development of training courses.

In the case of solar systems, before implementing a training course, the environment of the workshop (space and safety) is checked, the necessary quantity of solar panels, tools, roof base materials, water-proof materials, cables, solder and other consumable materials, textbooks and training assignment charts are prepared. It is also important to acquire information on fatal and injury accidents that occurred in past installation works. As is obvious, the instructor should thoroughly read and understand the lesson plan to make the training proceed smoothly.

At the actual training, instructor proceed a lesson by adequately incorporating safety instruction according to the lesson plan and observing the acquisition situation of the trainees. Show the trainees the right method of waterproofing work in an easy to understand manner, while at the same time showing the places with high risk of defective work and training how to avoid defective work.

In addition to giving guidance to trainees, it is important to clarify why the trainees were unable to do or understand based on the observation and evaluation sheet and make suggestions to improve lesson plans for the subsequent lesson.

There may be mistakes in technical handbooks of the industry cited in a textbook or the lesson plan may need modifying of sentence order. Such corrections should be made correctly and promptly and the evaluation information should be fed back to the design and development of training courses.

1.4.5 Trainee assistance

Trainee assistance is a function to help trainees continue their training, achieve their training objective and get a job where they can use what they have learned through the training. For this purpose, it is important to provide the following assistance according to the individual situation:

(1) Response to difficulty continuing training

It is required to analyze factors that may prevent trainees from continuing the training at the early stage of the training and provide assistance within the possible range. Cooperation with related bodies is important because such factors may include insufficient living funds, the burden of tuition fees and others that the VT institutions cannot cover. If trainees cannot continue training due to a personal relationship between trainees, their mental condition or other personal reasons, there are various ways to provide assistance. Investigate the cause, plan and take countermeasures.

(2) Response to difficulty achieving training objectives

Take an adequate measure after determining why the trainee cannot achieve the training objective; is it because he/she has misunderstood the lesson, learned a wrong way, or has a problem in learning? Each trainee had different experience before taking a course. Some may good at mathematics, while others may be inferior in physical ability. Instructors are required to provide advice in accordance with the different proficiency level and motivate each trainee in a way suited to him/her.

It is also important to devise ways to help all trainees achieve their targets by helping trainees lagging behind and to assist individual trainees' learning by giving separate assignments according to the progress of the training, for example.

(3) Placement support

Globalization of the labor market, changes in attitudes toward work among workers and diversification of modes of employment have progressed in Japan. Young people who could not find jobs after graduating from a school are increasing while industry is experiencing rapid aging of its workforce. As it is difficult to identify a suitable occupation in an increasingly diverse and complex society, there is even an undesirable tendency to make light of the meaning of working as a regular employee. With this significant change in the environment surrounding workers, it has become a major challenge for each worker to develop a career (developing vocational abilities through relevant work experiences and training) tailored to his/her capability and quality. It has become important for individual workers to objectively describe their past job experiences, their achievements in each job and their efforts in self-development, and then compare their aptitude and ability with the needs of desired employers and the labor market (career planning). This is an age where consulting services helping job seekers in career planning attract attention.

In this social climate, placement support for trainees who have difficulty in career decision and those whose current vocational ability is insufficient to get a job (see Figure 1-4) is one of the duties of VT instructors. They are expected to be capable of helping in career planning. Placement support includes motivating trainees by being empathetic to them, showing a good attitude as a member of society and helping trainees in developing a positive attitude toward employment.

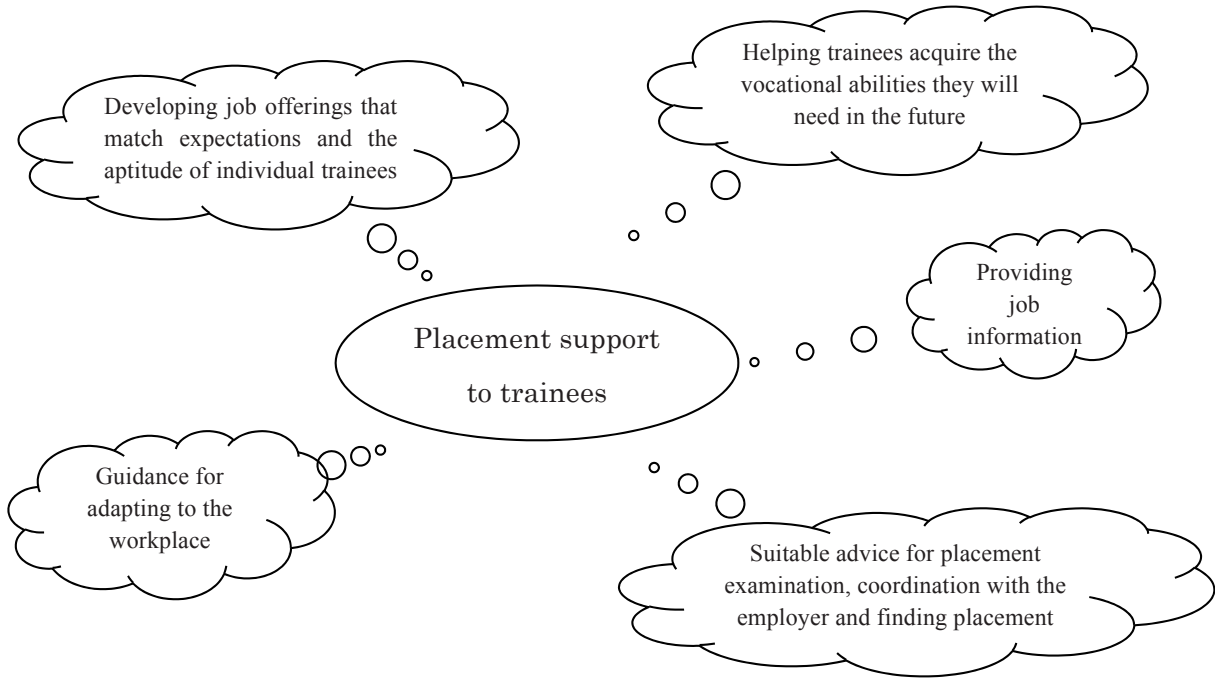


Figure1-4 Employment Support

From our past experience, we know that in order to help trainees continue training, achieve their training objectives and get a job in which they can use what they have learned in the training, it is best to gather the wisdom of the instructors and those of the entire VT institution rather than it being handled by individual instructors.

1.4.6 Management

This is the function of rational management of training courses from their analysis & planning through design, development, implementation up to trainee support, as well as resources (human, physical and financial) and schedule. It is also expected to create a mechanism to share information necessary for rational and effective implementation of training courses.

When a training course is set up and implemented, the conformity of the defined training purpose may not reach the expected value. It is inevitable that some of the trainees will be unable to achieve the training objective. It is the function of management to have the training implementation result fed back to the design & development and the planning & analysis departments to keep the improvement cycle of the training course running. This will be described using the example of the solar system training course.

(1) Analysis & planning phase

Management is conducted on the accuracy of the collection and analysis of information on problems in solar system installation works as well as the training course planning and whether the analysis and planning was conducted with adequate resources.

(2) Design phase

After the training course planning, management is conducted on the accuracy of the design of the training course curriculum, skill acquisition target of each subject, training items and training hours and whether they were designed using adequate resources.

(3) Development phase

After the training course design, management is conducted on the accuracy of the development of textbooks, PPT and other presentation materials, development of practice assignments, preparation of the classroom and workshop and the development of lesson plans and training procedure plans and whether they were developed using adequate resources.

(4) Implementation phase

After the training development, management is conducted on the accuracy of the preparation, instruction method and training evaluation and whether they have been conducted using adequate resources.

(5) Trainee assistance phase

Management is conducted on the accuracy of the judgment made in the trainee assistance and whether the assistance was provided using adequate resources.

Conducting the management (1) through (5) above and improving the training course by sharing improvement information obtained at each stage constitute quality management of a training course.

A key for quality management of implemented training courses is what evaluation result was obtained at the final phase of a training course, “implementation and assistance”.

Even if all of the trainees have achieved the training objective, the training objective might have been too low, or the training duration may be too long. There may be unnecessary subjects in the course. The training subjects may be poorly linked. It is necessary to examine at which phase (planning, development or design) study or resources were insufficient.

If the target was not achieved, it is important to know what percentage of the trainees achieved what percentage of the training objective. It is important to analyze the cause of the underachievement; whether it is in the curriculum and lesson plan, machines, tools & raw materials in the workshop, the textbook, training hours or the readiness on the side of trainees. The failure may be attributed to insufficient budget leading to insufficient quantity of equipment and consumable materials. An insufficient number of instructors or insufficient training capability of the instructors could be a factor.

It can be said that training is effectively managed only when these analysis results are shared by concerned personnel involved in planning, design, development, implementation and assistance of the training course and improvement is made.

Japan’s VT management indicators cover not only the quality management of training courses (including improving the skills of instructors) but also recruitment and placement of trainees (including training needs survey).

If there are only a few trainees who take a new training course, accurate analysis is required; is the information publicized adequately and has it reached local companies? Are the application conditions adequate? Does the attainment objective of the course meet the local VT needs?

If the trainees completing the training course could not get a job, it is necessary to determine the cause. Is it because their skill level and fields are different from those required by companies? Is it attributed to placement conditions not related to training, or insufficient skills/motivation of the trainee?

VT institutions of JEED receive instruction on open training courses (based on analysis and planning) from the Headquarters, set up (design and development), implement (implementation and assistance) and manage training courses. Each VT institution formulates quarter-term action plans, ensures through its operations promotion council a certain fill rate of its courses and an 80% placement rate of its graduates and implements quality management of training and company training needs surveys (management). For recruitment of trainees, VT instructors provide job seekers with explanation of VT courses, explain VT courses to officers of “Hello Works” (Public Employment Security Office) and carry out publicity activities. For placement support, they create “job cards” (contains employment record, education and vocational training background career sheet and etc.) and receive career consulting training, for example.

1.5 Persons in Charge of Each Function

Functions for the VT implementation described above are assigned to VT concerned personnel. Their duties are summarized in Table 1-9. As mentioned previously, parties in charge of the functions are required to regularly share information in order to adequately turn the PDCA cycle of VT and make necessary improvements.

Table 1-9 Functions and Duties of Persons

Function	Duties of the persons in charge
Analysis & planning	Responsible for ensuring that the training courses planned are adequate to the environment surrounding VT and training needs; making training objectives and targets clear.
Design	Responsible for ensuring that the designed targets, purpose, training subjects and hour allocation of each subject are adequate to the objective of the training course.
Development	Responsible for ensuring that trainees will be able to achieve the attainment objective if the training is implemented according to the preparations (ex. machines, tools & raw materials, training assignment, lesson plans) made at the development phase.
Implementation	Responsible for implementing the training as planned and ensuring that trainees will achieve the target, and also responsible for trainee achievement evaluation.
Trainee assistance	Responsible for ensuring that trainees continue training and get a job where they can use what they have learned through the training.
Management	Ultimately responsible for ensuring that the training courses achieve the outcome objective and attainment objective, and rational and efficient efforts are made for this purpose.

1.5.1 Persons responsible for long-term training courses

Persons responsible for implementing long-term training (two-year VT for graduates from school) in Japan are shown in Table 1-10. The State bears the function of analysis & planning for training courses, curriculum design and textbook development. This guarantees a common skill level among all graduates from the same training course all over Japan. When JEED plans a new training course, the public institutions apply for the State's approval of its content. For most projects to develop curriculum and textbooks for a new training course in Japan, instructors selected from public VT institutions across Japan are invited as project members. This is indicated by △ in the column of instructor in the table. Instructors are also responsible for development of training assignments, implementation of training and trainee assistance.

Table 1-10 Persons Responsible for Long-Term Training in Japan

Function		Party				
		The State	JEED	Executives of VT institutions	Instructors	
Analysis & planning		◎	○		△	
Design		◎	○		△	
Development	Textbook	◎	○		△	
	Training assignment, etc.			○	◎	
Implementation				○	◎	
Trainee assistance				○	◎	
Management				◎	○	

◎: Responsible party ○: Assistance △: Assistance as needed

1.5.2 Persons responsible for short-term training courses

Parties responsible for implementing short-term training courses (12-hour to 6-month up-grading VT for workers) in Japan are shown in Table 1-11. Up-grading VTs for workers implemented by JEED are short-term courses from 12 hours to 5 days normally. In Japan, up-grading VT for workers is provided to about 100,000 people annually. It is implemented differently depending on the region and VT institution according to the key industry of the region. Furthermore, needs for

up-grading VT for workers change every several years with technological innovation and changes in production items and methods. To ensure prompt response to such changes, the instructors are responsible for all functions from analysis and planning to management in Japan. Executives of VT institutions give advice and guidance concerning the VT courses proposed by instructors before approving them. This is a kind of bottom-up system starting from individual instructors.

Some may say “the system imposes too much burden on individual instructors from a global perspective. There should be divided into several sections”. However, the system is a major factor that has exponentially enhanced VT course development and the management capability of individual instructors in Japan. The advantage of the system is effective functioning of the PDCA management cycle realized by each instructor responsibly conducting management from analysis and planning to implementation and assistance. The biggest factor to lower the quality of a VT course is failure in running the PDCA cycle because phases from analysis and planning to implementation and assistance are not controlled by one person. Problems such as trainees not achieving their training target and low level of trainee satisfaction may arise in any VT course. The PDCA cycle is run to minimize problems and maximize effects. A feature of the VT system in Japan is that VT instructor themselves manage the PDCA cycle.

You may reform laws and systems concerning VT and allocate budgets but VT would not change if instructors could not follow the changes. One of the sources of dynamism to innovate and advance actual VT is the competence of individual instructors. In this sense, the broad functions fulfilled by instructors as shown in Table 1-11 present a theme for discussions on how to renovate national VT.

Table 1-11 Persons Responsible for Short-Term Training in Japan

Party Function		The State	JEED	Executives of VT institutions	Instructors
Analysis and planning			○	○	◎
Design			○	○	◎
Development	Textbook			○	◎
	Training assignment, etc.			○	◎
Implementation				○	◎
Trainee assistance				○	◎
Management				◎	◎

◎: Responsible party ○: Assistance △: Assistance as needed

1.5.3 Persons responsible for development, implementation and trainee assistance functions

Some trainees say “that instructor is good at teaching. Taught by him, I’ve come to understand the subject well and acquired the skill”.

Analyzing the training of such instructors, you will see that they can provide the right guidance because they know why their trainees fail to understand and where their understanding has stopped, while at the same time understanding the process of understanding the subject and learning the skills.

On the other hand, poor instructors simply push a superficial learning method because they don’t know why trainees fail to understand or learn the skills.

Japan’s VT adopts a method in which individual instructors conduct development and implementation of the training (subject) course of their charge and provide assistance to their trainees. Each instructor sets a training environment (preparation of classroom/workshop, development of training materials and assignments), proceeds the training procedure based on the lesson plan developed by him/herself, and provides trainee assistance based on observation of the trainees’ acquisition situation during the class. This helps him/her figure out whether and why trainees fail to understand and learn the skills and facilitates improvement of the subsequent lesson plans.

These activities of instructors may be compared with those of an orchestra conductor. It is a feature of Japanese VT that instructors lead the entire training, and whether the training is implemented vigorously and lively depends on the instructors. They prepare a training environment including the workshop, machines, materials, equipment, tools and textbooks, develop lesson plans, give trainees lessons, lead them to their training objective, provide tutoring to trainees

lagging behind while walking around the students' desks and check and evaluate their own training method. It is characteristic for Japanese instructors to reflect the evaluation result in the subsequent lesson plans in an effort to improve their lessons.

Consequently, developers of training courses (preparation of training environment, textbook, training assignment and lesson plans) are required to have practice training capability. For one thing, they are required to have skills higher than the attainment objective set for the training; for another, they are required to have broad experience in guidance to help various trainees surely achieve their attainment objective.

When implementing training, instructors always evaluate and judge the characteristics of their trainees. During the training this is why they can advise in what occupation and company the trainees can use their ability and provide sound placement support. It is characteristic for VT of Japan to believe that instructors can provide not only support for skill acquisition during training, but also best placement support.

Various trainees enter a VT institution. In recent years, there are also trainees with minor learning difficulties and mentally unstable trainees. Each time instructors find trainees failing to master something, they work on improvement of the lesson plans and enhancement of trainee assistance. Because each instructor develops and implements training (subject) courses and provides assistance to his trainees in a consistent way, efforts to improve training methods are surely repeated to enhance their training capability.

However, the system of one instructor handling development, instruction and assistance also has its weak points. If the causes of trainees' failure to understand and acquire skills are not sufficiently evaluated and investigated, they may be left as they are. It is desired for VT in the 21st century to enhance training methods to prevent this and ensure trainees' success in training.

1.6 Training of VT Concerned Personnel

Persons responsible for individual functions are described in 1.5. This section describes the training of VT instructors in particular.

1.6.1 Institutions specialized in training new instructors

New VT concerned personnel are trained in specialized agencies. In Japan, this is the responsibility of the Polytechnic University (PTU). PTU is a four-year university administered by the Ministry of Health, Labour and Welfare and operated by JEED. Since its opening in 1961, PTU, which is the only institution of higher education aimed at training of VT instructors, has sent over 10,000 graduates to the VT world and the manufacturing industry.

PTU features cultivation of three abilities: ability in the technical field (ability to perform skills), ability in the engineering field (scientific insight and engineering design capability) and ability in the field of instruction (training capability, training design capability). For this purpose, PTU requires 178 credits with 5,600 hours for graduation compared with 124 credits with 3,000 hours of ordinary universities. Graduates receive both a VT instructor license and a bachelor's degree (engineering).

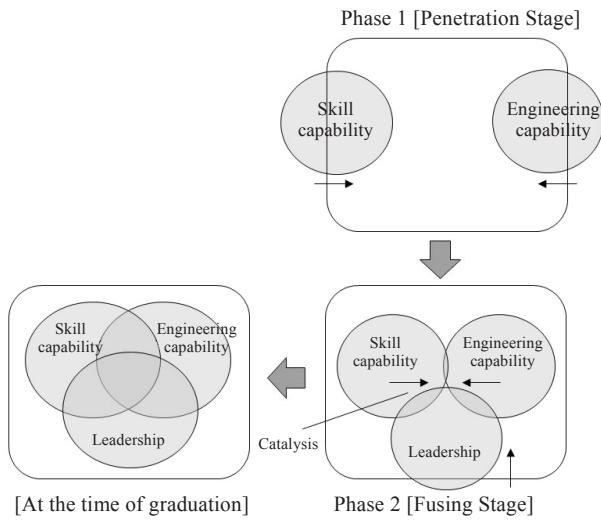
The four-year education of the instructor training course at PTU is divided roughly into two stages (see Figure 1-5).

Phase 1: Penetration Stage

This is the period necessary for a person to assimilate technical and engineering capabilities in a consistent manner. It corresponds to the first three years in which students conduct skill practices while learning engineering and science subjects.

Phase 2: Fusing Stage

This is a period for them to acquire VT instructor spirit through learning training methods and developing training materials while at the same time fusing technical and engineering capabilities by actively using the catalysis effect of training practice (learning through teaching). The period corresponds to the three years from the second to the fourth grade. Trial lessons (see Figure 1-6) for training practice begin in earnest in the second year. Junior students experience actual training in a one-month internship at a VT institution.



(A square frame in the figure represents one person.)
Figure 1-5 Concept of Education System of PTU



Figure 1-6 Trial Lesson

(Source: Eninnering education on P.40-43 of “Human Resource Development Philosophy and System of Our university – Training for instructors who combine engineering with technical skills–”, No272, 2010-7 by Murakami)

1.6.2 Off-JT at external institutions

For improving abilities after taking a job as instructor, external institutions provide off-the-job training (OFF-JT). Instructors choose and take from among training programs offered by various external institutions as needed.

In Japan, PTU fulfills a major function as an institution providing OFF-JT by implementing training to improve abilities for about 3,000 instructors annually. This means that all instructors in public institution across Japan have an opportunity to take a training course once every two years. Table 1-12 shows the outline of its training programs.

Table 1-12 Training Implemented by PTU

Category	Outline of training program
Training for new instructors	Training to improve practical instruction capability and ability to solve problems in VT
Skill/technical training	Training to acquire new skills/techniques to respond to the increasingly diversified and sophisticated industry needs
Training method training	Training to learn knowledge and skills concerning training methods and training material development
Training program by level	Tailored to the level of instructors (younger, mid-level, leader) Ex. safety management promotion, placement consultation, leadership, training coordination

1.6.3 OJT at VT institutions

Instructors can take training at external institutions only for limited number of days. For this reason, On-the-job Training (OJT) at VT institutions take a core function for ability development of instructors. In order to effectively develop the abilities of junior instructors through OJT, it is necessary for senior instructors and managers to be actively involved in OJT and provide systematic guidance.

Following is the typical example of OJT at a VT institution with up-grading VT for workers. It is not usual in Japan for junior instructors develop a new up-grading VT course for workers. The general OJT process for instructors to develop ability to create a new up-grading VT course for workers is shown below. It takes five to 10 years for an instructor to become able to develop a new course through this OJT process. The major premise of the OJT process is efforts of the instructors but advice and guidance provided by senior instructors and managers are also essential. OJT at VT institutions is a coordinated initiative.

(1)Assigned to an existing up-grading VT course for workers

Assigned to an existing course that is held at the institution every year

(2)Developing a course similar to existing ones

Developing a second part to an existing course of the own institution and a new related course

Developing a new course at the institution using as a model a course held in another VT institution

(3)Developing a order made course

Developing new courses for individual companies based on their request

(4)Developing ready-made courses

Developing new courses based on the identification of VT needs of the region/industry

Another point for effective OJT of instructors is well-planned implementation following the steps as in the case of usual VT. Table 1-13 shows the relationships between the course types and the function of instructors in the OJT process of up-grading VT for workers. You can see that OJT progresses from simple to difficult in sequence.

Table 1-13 Type of VT Course for Workers and the Role of Instructors

Function of instructor \ Type of up-grading VT course for workers	(1) Implementing existing courses	(2) Developing and implementing courses similar to existing ones	(3) Developing and implementing order made courses	(4) Developing and implementing ready-made courses
Analysis and planning	—	—	△	○
Design	—	○	○	○
Development (textbook, training assignment)	△	○	○	○
Implementation	○	○	○	○
Management	○	○	○	○

○: Major function △: Partial function

For the nation to advance the development of VT human resources, it is important to build an ability development system throughout their career combining the three factors above (new instructor training, Off-JT and OJT) and construct a framework to support the system.

Figure 1-7 shows an example of typical career as instructor.

Duties	20s	30s	40s	50s
Implementing training	*Safety management promotion, * trainee assistance for placement			
Developing training courses	*Training coordination, *OJT support			
Project leader (associate professor)	*Leadership			
Business planning/ junior instructor training (professor)	*Problem-solving technique			

* Examples of training course by level

Figure 1-7 Image of Instructor Career in Japan