Guide for ASEAN Instructors | GAIN

Vocational Training Instructors Manual for ASEAN

March 2016

ASEAN-Japan HRD Collaboration Programme

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CONTENTS

Developing the Vocational Training Instructors Manual

Considering the employment conditions based on various industries and educational communities, the vocational training (VT) in Japan has made contributions to the society in order to achieve the purpose of enacting the Human Resources Development (HRD) Promotion Act, namely to achieve employment stability for laborers including to develop and to enhance their vocational ability. The VT courses provided have changed their forms, such as training for the unemployed, training for junior high school graduates, training for those leaving or transferring jobs, up grading training for employed workers, and advanced training for high school graduates.

In Japan, VT instructors working for public VT institutions have spared no effort in supporting VT related activities. Before the importance of process management (PDCA) regarding organization management was recognized, they changed and adjusted the VT course content with the focus on employment conditions, industrial trends, and the trends among graduates, while developing, operating, and enhancing VT courses. Needless to say, not only changing the training materials, but also reviewing the training courses, including changing instruction methods was required to change the two-year training course targeting junior high school graduates to a one-year training course mainly targeting job seekers. Currently, the VT course for unemployed workers has been implemented for six months based on two training objectives (one training objective is achieved in three months) which are adapted to the conditions of local industries. This VT course for unemployed workers is called “System Unit Training” which adopts the concept of ILO module training. This training method is developed from VT management knowhow accumulated by VT instructors. This training method has maintained a high employment rate.

Global intergovernmental cooperation in the field of HRD was officially started in 1961. In this framework too, VT instructors were dispatched from the Overseas Technical Cooperation Agency (currently known as Japan International Cooperation Agency (JICA)) as long/short-term VT experts to developing countries in order to operate and manage VT institutions including the implementation of VT courses. By doing so, they have played a part in the development of industrial human resources in overseas countries. The training forms actually varied depending on the country, such as VT for graduates from schools and VT for employed workers. The characteristic point in this cooperation method was not merely to introduce the VT system of Japan into each country, but to engage in VT systems and operation of VT institutions in collaboration together with each counterpart while the industrial conditions and educational systems of each country were considered. We can say that this cooperation met the purpose of international cooperation support where VT institutions were operated by each country themselves after the relevant cooperation project ended.

As mentioned earlier, the Japanese VT instructors have examined the entire concept of educational training and have implemented a variety of VT courses having their focus on the point as to what kind of VT courses can really lead to societal contributions within a legal framework that supports public vocational training. We have managed training institutions and equipment, prepared training materials, and examined effective training methods in order to achieve a certain level of training results to the point where we are now. Our experience of implementing VT courses in Japan enabled us to conduct VT based on a consideration of related conditions of each country (industrial and educational conditions) within the international-cooperation framework.

This manual contains the management knowhow of VT institutions, and VT courses, and the knowhow regarding instructions for practice and theoretical subjects accumulated by VT instructors over the last three years.

We introduced PDCA training management, persons in charge of PDCA as well as management and evaluation (POCE) in the first year (2013). We picked up the need for analysis, planning, design and development of VT courses by training management in the second year. In the third year, we introduce the core of the instructor’s manual which is the instruction skills for class procedure.

It is inevitably necessary to refer to services and work done by VT instructors and concerned person in charge and, it will be useful to the newly recruited instructors.

We hope that this manual will serve as help for development of industrial human resources in ASEAN countries. We also desire that tireless efforts will be made so that all VT concerned personnel can make further contributions to the society with the use of this manual while working with challenging and rewarding feelings.

To develop this manual, we utilized “PROTS, CUDBAS”, and “Theory and Practice of Vocational Training”.

Finally, we would like to express our gratitude to all VT personnel that took part in the development of the manuals for their understanding and for the utilization of the materials in these manuals for reference.

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-carrier 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:

①Dispatched 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.

②Contract 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.

③Part-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.

④Outsourcing

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).

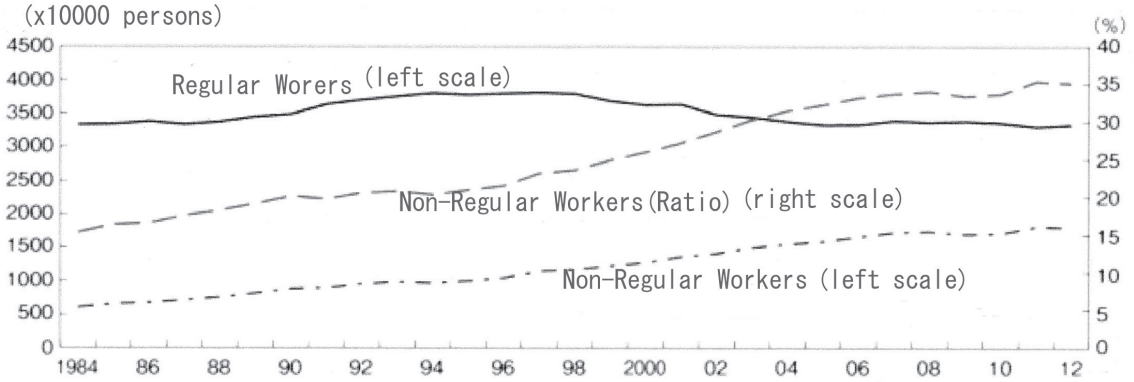

Figure 1-1 Changes in the Number of Regular and Non-Regular Workers

(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

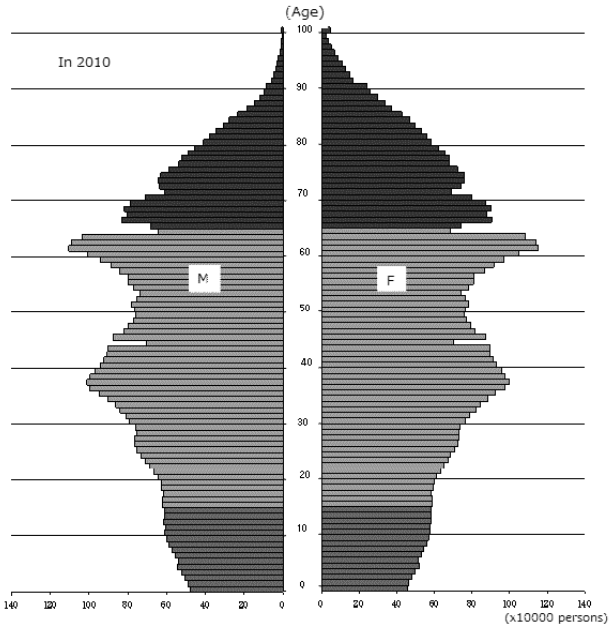

Figure 1-2 Population Pyramid

(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.

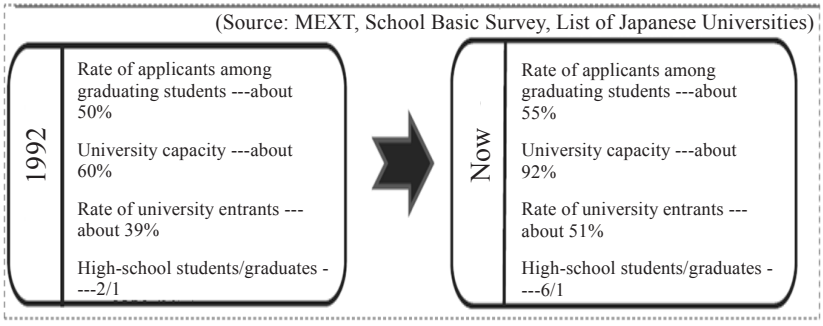

Figure 1-3 Current State of Universities

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

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	•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

1. Title: Filing
2. Purpose: Using each tool correctly results in efficient manufacturing of high-quality products. The practice should be the basis for acquiring this skill.
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.
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
5. Readiness: Can implement 4S. Can use protective gear (eyeglasses, gloves, protective footwear).
6. Timing: First week, the first lesson of Machine Processing Practice Course.
7. Number of trainees: 20
8. Place: Machining workshop
9. Time required: 6 hours
10. Training materials, etc.: Training assignment No., vices, dolly blocks, files, hand grips, brass bars (φ40×200mm)

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.

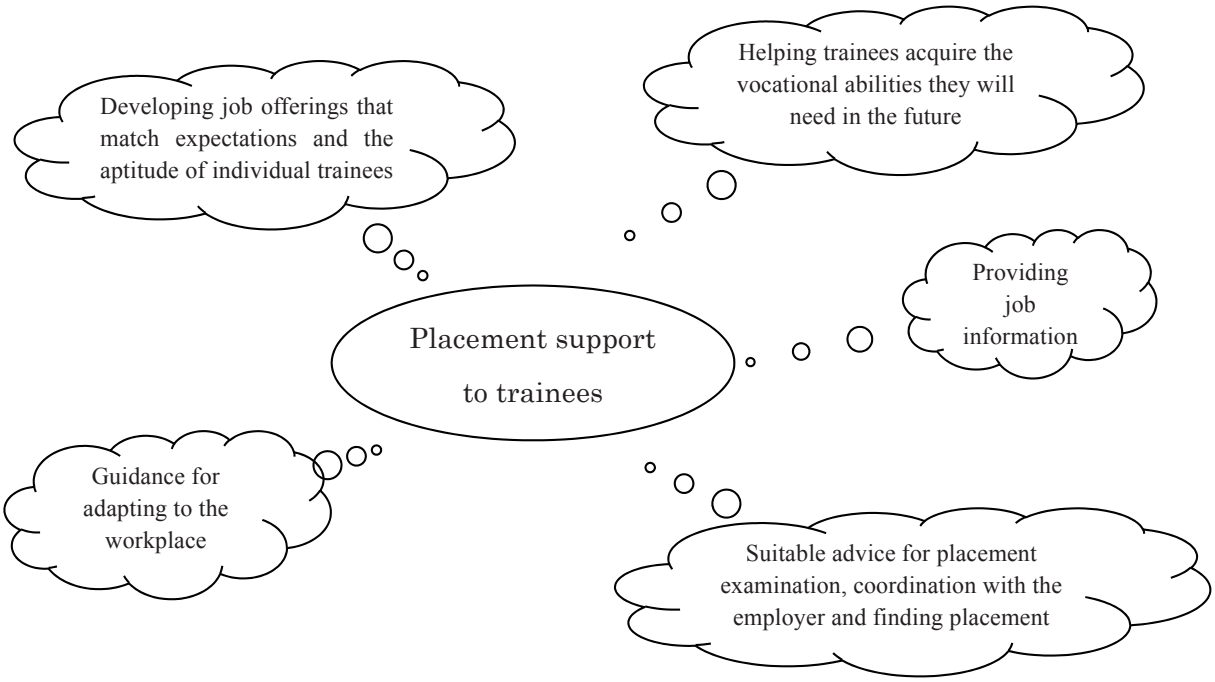


Figure1-4 Employment Support

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).

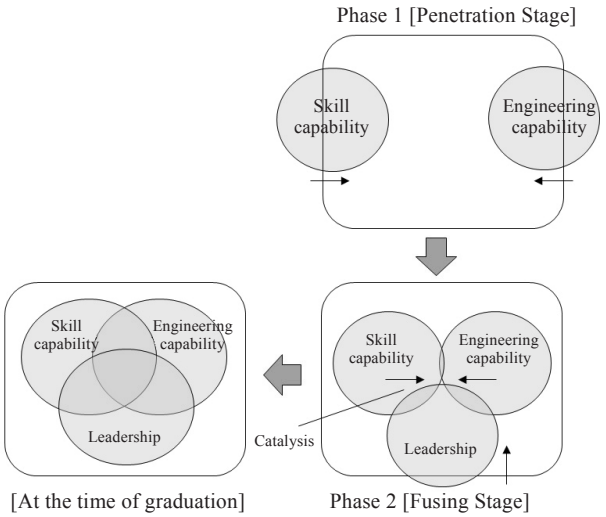
The four-year education of the instructor training course at PTU is divided roughly into two stages (see Figure 1-5).

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

Type of up-grading VT course for workers / Function of instructor	(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

Chapter 2 Management and Evaluation of VT

Without evaluation of whether an outcome of VT achieved its objective and target, efficiency of the method, etc., you cannot improve the VT at the next stage. It is important to rationally establish and manage evaluation items at the stage of implementation planning.

2.1 Perspective of VT Management

Adequate and continuing implementation of VT requires adequate management. For adequate management, it is important to run the PDCA cycle ensuring the consistency of POCE. This section explains PDCA and POCE.

2.1.1 PDCA: VT improvement cycle

The PDCA cycle is a method to incorporate improvement activities into the process of continuing implementation of not only VT but also various projects. It is believed that you can continue a project while improving it by turning the cycle of Plan, Do, Check and Act.

(1) P (Plan) stands for planning a project; planning of items necessary to obtain good results in the project.
(2) D (Do) stands for doing what you have planned.
(3) C (Check) stands for checking the result of doing. Check whether good results are obtained; if not, identify where problems lie.
(4) A (Act) is activity to improve problems. If any parts have a low rating, take action to improve them.

Plan, implement, evaluate and improve a project and then implement the project again. By doing this you can obtain better results. The idea is that the project will become increasingly better through the repetition of the cycle.

2.1.2 POCE

POCE is the idea that “you can obtain good results by operating a project while maintaining the consistency of the P (Purpose), O (Objective), C (Content) and E (Evaluation)”. You can conduct a project in a desirable direction only after turning the cycle of PDCA with consistent POCE. The following is an explanation of the meaning of POCE.

(1) P (Purpose) is the purpose of conducting the project. Make clear for what is the project for, what challenges are going to be solved and who will take benefit.
(2) O (Objectives) defines which condition is recognized to be successful in order to meet the purpose. What kind of state solving challenges or taking benefit.
(3) C (Contents) determines the content of the activities toward the objectives and carry out the activities.
(4) E (Evaluation) means evaluation of the project. Evaluate whether the result of carrying out the project serves its purpose, whether the objectives have been achieved and whether the results are rational and efficient.

2.1.3 Relationship between PDCA and POCE

The relationship between PDCA and POCE is shown in Table 2-1. Table 2-1 shows an approach to POCE in the operation of the training course. This is also an example to study on how to improve PDCA after the completion of the course.

As shown in Table 2-1, P (Plan) of PDCA roughly corresponds to P, O and C of POCE, while D (Do) of PDCA corresponds to C of POCE. C (Check) and A (Act) of PDCA serve as details of E of POCE. P (Plan) and D (Do) of PDCA are broken up into P (Purpose), O (Objectives) and C (Content) of POCE, which makes setting of evaluation items easier.

Then, how is training that was planned and implemented as shown in Table 2-1 evaluated? In other words, what improvements are to be made when the training is implemented again? As shown in Evaluation of POCE for Check of PDCA in Table 2-1, (1) graduates performed superbly, and (2) the course completion rate exceeded the target. So, is this a good training course with no need for improvement?

Table 2-1 PDCA with Inconsistent POCE

PDCA	POCE	
Plan	Purpose	Spread leading-edge skills in the local industry
	Objectives	(1) Enable the trainees to master leading-edge skills in one year (2) Achieve a course completion rate of XX%
	Contents	Develop a curriculum and training environment enabling repeated practice of skills used at workplace of companies using leading-edge skills. Assign excellent instructors with leading-edge skills.
Do		Implement training employing the plan and instructors mentioned above
Check	Evaluation	(1) Graduates performed superbly. (2) The course completion rate exceeded the target.
Act		Objectives have been achieved. Is there need for improvement?

In fact, trainee completed the course performed superbly but failed to get into a local company. In Table 2-1, the Objectives of POCE are (1) Enable the trainees to master the leading-edge skills in one year, and (2) Achieve a course completion rate of XX%. In terms of the Objectives, the course appears to be excellent because trainees have mastered leading-edge skills and the completion rate is high. However, it has not accomplished the Purpose of the training course, "Spread leading-edge skills in the local industry". Can we rate such a course as excellent? This kind of discrepancy is solved by ensuring consistency of POCE.

In the case of the training course in Table 2-1, P (Purpose) of POCE is not consistent with O (Objective). With P (Purpose) being dissemination of leading-edge skills to local industry, O (Objective) such as (3) XX% placement rate of graduates and (4) X% of graduates feel that they have spread leading-edge skills should be added to (1) and (2) as shown in Table 2-2.

Furthermore, you should make additions and changes to C (Contents) in accordance with the added O (Objective) so that it includes support for the trainees' placement in local companies and coordination with local companies. In response to the increased O (Objective), add to E (Evaluation) (1) graduates' acquisition level of the leading-edge skills, (2) completion rate of trainees, (3) placement rate by local companies needing leading-edge skills, and (4) the rate of graduates who think their company is now taking advantage of the leading-edge skills. Table 2-2 is an example of management considering the consistency of POCE.

Table 2-2 Revised POCE (PDCA cycle with consistent POCE)

PDCA	POCE	
Plan	Purpose	Spread leading-edge skills in the local industry
	Objectives	(1) Enable the trainees to master the leading-edge skills in one year (2) Achieve a course completion rate of XX% (3) Rate of graduates' placement at local company: XX% (4) XX% of the companies feel that the graduates spread the leading-edge skills
	Contents	(1) Develop a curriculum and training environment enabling repeated practice of skills used at workplace of companies using leading-edge skills. Objectives (1)(2) (2) Assign excellent instructors with leading-edge skills. Objectives (1)(2) (3) Support for placement at local companies. Objectives (3)(4) (4) Coordination, consultation and information exchange with local companies. Objectives (3)(4) (5) Assign support personnel in charge of (3)(4). Objectives (3)(4)
Do		(1) Implement training employing the plan and instructors mentioned above. (2) Implement support for placement at local companies and coordination, consultation and information exchange with local companies as mentioned above.

Check	Evaluation	(1) Graduates performed superbly. (2) The course completion rate exceeded the target. (3) The rate of graduates' placement at local company exceeded XX%. (4) XX% of the companies feel that the graduates spread the leading-edge skills.
Act		As the results met the purpose and objectives, The next session will be implemented in the same way.

What is distinct in Table 2-2 is that O (Objective) includes those concerning capability development of trainees (Attainment objective: Objectives (1)(2) in Table 2-2) and those corresponding to the purpose of the training course (Training objective: Objectives (3)(4) in the Table 2-2). It is necessary not only to have the trainees' skills reach the attainment objective, but also to achieve the training objective.

If planning and execution as described in Table 2-2 produced good results, it can be said that good training was implemented. On the other hand, if the result is that the graduates failed to get a job in a local company as in the case of the training course shown in Table 2-1, it will be necessary to consider activities to improve graduates' placement rate in the region. Specifically, determine the reason why the trainees did (could) not get a job in a local company. There may be various reasons such as: companies outside of the region employed the trainees because they had acquired leading-edge skills; the trainees' leading-edge skills are not those desired by companies; and there is no local company with a need for leading-edge skills. By conducting necessary surveys assuming such reasons (analysis and planning) and taking measures according to the reason (design and development), you can turn the cycle of PDCA with consistent POCE.

2.2 Management Perspective

Good VT should be consistent with POCE in considering management, therefore we need the management perspective of (1) making trainees reach objective (Attainment objective), then (2) achieving the objective of training corresponding to the purpose of VT (Training objective), and (3) ensuring rationality and efficiency of (1) and (2). Figure 2-1 shows the relationship of this with POCE.

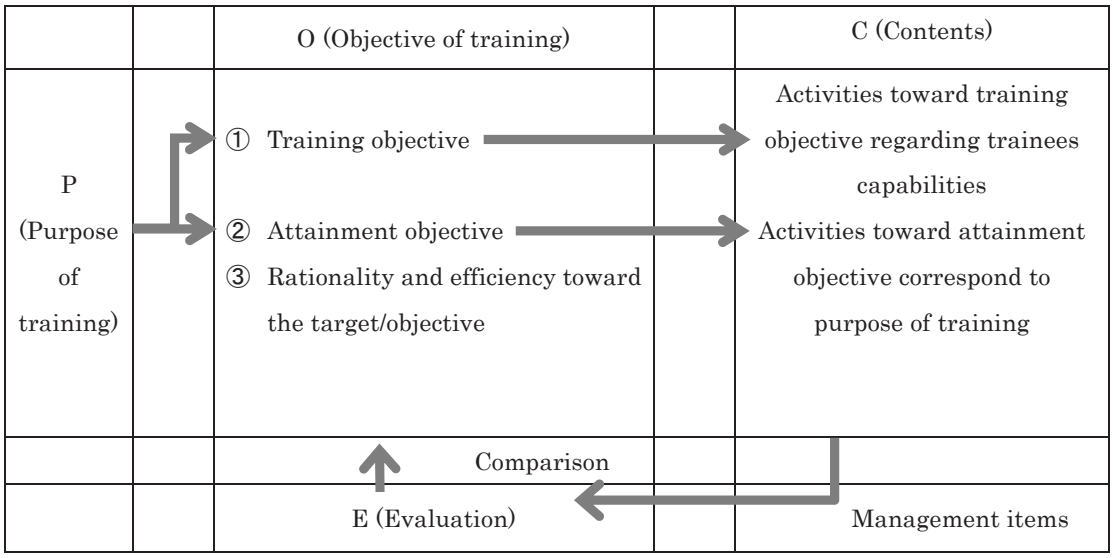


Figure 2-1 Management Perspective Based on POCE

The attainment objective (capabilities companies desire from new trainees) is set considering the skills necessary for graduates to accomplish the purpose of the training (ex. improve the employment rate of new trainees in the region).

Examine the content of the training method to ensure achievement of the attainment objective, create an environment for implementing the training, and implement activities to achieve the attainment objective (implementation of a training plan and training).

As a result, you can achieve the training objective (ex. employment rate of trainees at occupations related to the training) corresponding to the purpose of the training. In order to achieve the training objective, conduct “activities to achieve the training objective” (ex. placement support, recommendation of graduates to companies) in addition to training.

Among these activities, management of training is activities to collect management items representing the status of activities for achieving the training objective and attainment objective (status of job searching and skill acquisition) and to evaluate the rationality and efficiency of training objectives, attainment objective and activities to achieve them in order to improve these activities.

2.3 Management Objects (Examples of Management Items)

2.3.1 Examples of management items related to training objective

Management items of the training objective (O) corresponding to the purpose of the training (P) may include the examples in Table 2-3. Deciding the level of the items to reach at the end of the training constitutes target setting. Management concerning the training objective is activities to catch up the status of these management items and make modifications to achieve the training objective.

In order to design these management items, it is necessary to clearly define the purpose of the training. When setting a training objective, you must be able to clearly explain its relationship with the purpose of training.

Table 2-3 Training Purpose and Objective

Purpose of training (P)	Examples of management items concerning training objective (O)
Secure staff resources of local companies	・Rate of placement at local companies ・Rate of placement in related occupation ・Improvement in local companies' perception of human resource shortage ・Local companies feel that they could obtain necessary human resources by employing graduates from VT course
Promotion of specific industrial fields in the region	・The extent to which the industry was promoted (increase in the number of companies and those of the target occupation) ・The extent to which the graduates are employed at the target occupation/ company of the industrial promotion
Lower the local unemployment rate	・The extent to which local unemployment rate was lowered
Reduce work accidents of new workers	・The extent to which the work related accident rate of placed graduates was reduced
Capability development of workers who lack skills necessary at workplace	・The extent to which the graduates could use the acquired capabilities at work (whether they have opportunity to use them; whether the capabilities acquired through the training match the needs at workplace)

2.3.2 Examples of management items related to attainment objective

Attainment objective (capabilities to be acquired by graduates) are expressed with the scope and level. Capabilities to be acquired vary depending on the purpose (P) of the training. For example, (1) a training course aiming to develop capabilities of precision machining, and (2) a training course intended to supply capabilities of basic machining are both designed the machining skills but their contents are significantly different. Therefore, the relationship between the purpose and the attainment objective must be clearly explained as is the case with training objective.

Capabilities expected from graduates according to the respective purposes are set as attainment objective, management items of which may include the examples in Table 2-4.

Table 2-4 Training Purpose and Attainment Objectives

Purpose of training (P)	Examples of management items concerning attainment objective (O)
Secure staff resources of local companies	Acquisition situation of capabilities that local companies require from new employees
Promote specific industrial fields in the region	Acquisition situation of capabilities that specific local industry requires from new employees
Lower the local unemployment rate	Acquisition situation of capabilities required by the industry that can employ more workers in the local labor market.
Reduce work accidents of new workers	Acquisition situation of capabilities to effectively use methods to prevent work accidents
Develop capability of workers who lack skills necessary at workplace	Acquisition situation of capabilities necessary for solving problems workplaces are facing

Capabilities of trainees may be assessed before, during and after the training. Evaluation before the training is made to check whether they have ability to participate in the training and divide the training course into classes by capability level, for example. Assessment during the training is conducted to provide the trainees with feedback on whether they have mastered the training content to that point. Assessment at the end of the training is conducted to check whether the attainment objectives are achieved.

The instructors evaluate the level of achievement of the attainment objectives and provide the trainees with feedback on the results. The training manager compiles the results, confirms whether any of the trainees have difficulty, provides support as needed and uses the results for training completion certification.

2.3.3 Management items concerning rationality and efficiency toward objective of training

There are many management items concerning rationality and efficiency to achieve objective of training. Rationality means the consistency of the objective of training and contents (scope and methods of efforts) with the purpose of the training. To ensure efficiency, check whether the efforts (scope and time, labor and cost used for each of them) to achieve the objective of training are implemented in a lean way.

Rationality and efficiency sometimes go together but sometimes not. In a training course with the attainment objective "capable of using a certain equipment", when teaching how to use the equipment, it is rational to create an environment for all trainees to use the equipment to learn how to use it. It may seem to be also rational to prepare one piece of equipment for every trainee so that all trainees can practice at one time. However, given the cost of preparing the equipment for the number of trainees, it is not necessarily efficient. If you divide the class into two groups and teach one group in the morning and the other in the afternoon, the necessary number of equipment is reduced to one half. This way, you can improve efficiency while maintaining rationality. However, the instructor who can teach how to use the equipment may be busy and available for the class only in the morning. If the number of the equipment is only one half that of the trainees, only one half of the trainees will be able to practice in the morning while the other trainees will be just observing. This way, one half of the trainees would not become capable of using the equipment. If two trainees are to use one piece of equipment, their level of achievement would be lower than half of the level they would have achieved by using it alone. It may be efficient in terms of the cost of purchasing the equipment but rationality would be reduced.

This way, rationality and efficiency sometimes go together but sometimes not. Because priority is given to rationality which means achieving the attainment objective, it is necessary to examine how to increase efficiency while maintaining rationality. Table 2-5 gives examples of management items concerning rationality and efficiency and an outline of their respective control items.

Table 2-5 Example of Management Items Concerning Rationality and Efficiency Toward Objective of Training

(1) An environment that facilitates participation in the training Facility and equipment (room, whiteboard, projector, machines, tools) Training materials (car for practice, PPT materials) Materials (cables, gasoline)
(2) Usage of funds
(3) Response to various conditions of trainees Expectation/wish, factors disturbing learning, capability acquisition status, progress of career activities
(4) Response to risk Safety and health in and outside the training, complaints, misconduct by personnel/trainees, changes in expectations on VT, compliance with laws
(5) Consistency of POCE
(6) Training implementation organization Capability, necessary number and education of the staff Target sharing, division of roles, mutual help, motivation
(7) Improvement of VT concerned personnel's capabilities to perform tasks

(1) Environment that facilitates participation in the training

Creating an environment that facilitates participation in the training is rational for the purpose of helping the trainees

achieve the attainment objective because it will raise the trainees' motivation and enable them to repeat practices as many times as necessary using all machines, tools and materials they need. On the other hand, preparing excessive facilities and equipment involves useless expenses impairing efficiency. It is necessary to create an environment facilitating participation in the training while maintaining rationality and avoiding excessive investment.

Items to management to create an environment that facilitates participation in training are roughly divided into facilities/equipment, training materials and other materials. These items are managed from the perspective of preparing a sufficient quantity, ensuring good functioning, preventing theft, etc. If it is planned to let every trainee use one piece of equipment, it is necessary to check whether the quantity of the equipment corresponds to the number of the trainees, whether there are necessary tools to operate the equipment and enough raw materials for repeated practice if materials are to be processed.

Confirm whether the training is operable with the facility/equipment, training materials and other materials indicated in the training plan and the environment is actually prepared. Next, confirm whether they are in an available state. Furthermore, it is necessary to prevent their loss due to theft, etc. (See Table 2-6). The equipment is required to confirm their quantity and functions, procure for shortfalls if there are any, and prevent their loss during the training.

Table 2-6 Example of List of Workshop Equipment

Name of equipment	Date of confirmation (YY/MM/DD) Confirmed condition	Date of confirmation (YY/MM/DD) Confirmed condition
Coated arc welding machine	Good	
CO2 welding machine	Good	
TIG welding machine	Good	
Shearing machine	A part is missing about 30cm to the right of the edge Work avoiding the missing part.	
Beveling machine	Good	
Smoke discharging equipment	Lid of the ○○ plate duct is not good. Need to request repair	
Screen	Good	
Workbench	Good	

(2) Usage of funds

You will need funds to create an adequate training environment. Spending money for things necessary to enable trainees to achieve their attainment objective is important to increase rationality and efficiency.

If trainees bear the expense of the training, it is necessary to estimate the amount necessary for the training as the basis of calculation of the training expenses. It is also necessary to manage that the obtained funds will last during the training duration. Expense items to be managed may include the following:

①Personnel cost

Expenditure for instructors who implement the training. If an instructor is invited from outside, you can calculate the expense for the instructor per trainee by dividing the compensation to the instructor by the number of the trainees. In some cases, indirect personnel expenses such as those for office workers may be included.

②Raw materials cost

Expenditure for materials consumed through the training. Various materials may be consumed. Total all of them and calculate the cost per trainee. Repeated practice is necessary to advance skill level but consumes a large amount of materials and increases Raw materials purchase cost. It is important to design training assignments with high training effectiveness considering rationality and efficiency.

③Tool cost

Expenditure for tools that are not consumed in a single year. Their annual depreciation can be obtained by dividing the cost of individual tools by their average usable years. In some cases, wear and tear expense of facilities/equipment may

be included.

④Utilities cost

Expenditure for lighting, running water and electricity at the place where the training is implemented. For the expenditure for running water and lighting that are used just because there are people, determine a fixed amount and multiply it. Costs of a large amount of water used for dyeing and a large amount of electricity used for welding are calculated separately.

Such calculations may be used as the basis for the cost to implement a training course (See Table 2-7), the basis for a budgetary request if the training is provided at the public expense, the basis for various training performance reports and the budget request of the next year. If you record the material costs as the training progresses (See Table 2-8), you can use the record to estimate consumption of raw materials according to the budget (See Table 2-9).

Table 2-7 Example of Course Fee Reckoning Table

Course Fee Reckoning Table				
Training course			Number of trainees	○
Training days/hours				
				Amount per trainee
Utilities	General unit cost	1,500/trainee/day		○○
	Special cost of the course	2,000/trainee		○○
Subtotal				○○
Compensation	Class C	7,000/hour	○hour	○
	Class B	10,000/hour	hour	
	Class A	15,000/hour	hour	
Subtotal				○○
Training material cost				○○
Raw material cost				○○
Subtotal				
Total: course cost per trainee				

Table 2-8 Example of Management List of Training Materials (table of tools and materials by assignment)

Training course	Welding course
Training assignment	Medium steel plate downward coated arc welding without backing
Machines and tools to be used	
Welding machine	1 /trainee
Workbench	1 /trainee
Tongs	1/trainee
Protective equipment (mask, gloves, apron, gaiters)	One set/trainee
Raw materials to be used	
Steel plate: 3×6 t9	2 sheets 10 trainees/8 hours
Welding rod: D4301	5kg 10 trainees/8 hours

Table 2-9 Example of a Raw Materials Management (stock card by material)

Material		Steel plate		
Specification		3×6 t9		
Reception date	Received quantity	Date of use	Amount used	Stock
MM/DD	2			2 sheets
		MM/DD	1 sheet	1 sheet
		MM/DD	1 sheet	0 sheets
MM/DD	2			2 sheets
		MM/DD	1 sheet	1 sheet
		MM/DD	1 sheet	0 sheets

(3) Response to various conditions of trainees

Family problems and troubles among trainees that throw the trainees' concentration off the training are factors to prevent them from achieving their Attainment objective. Solving such troubles before becoming a big problem will increase rationality and efficiency in achieving the training objective and attainment objective.

Specifically, this is a kind of management to support trainees to receive training toward a desirable future for them. There may be the following management items:

- Compatibility between the purpose of the training and that of the trainee (expectation, wish)
- Check for impediments to the trainees' learning during the training. Examples are: falling behind others in the classroom, education cost, family conflicts, delinquency, bullying or interference among trainees or by others, harassment by people involved in training, health problems.
- Progress in receiving the training: whether the trainees are taking the relevant subjects; performance of the each subjects
- Progress of career activities. Confirm their desired career, whether they have undergone an exam/interview of the desired company, etc.

Catch up the items above through regular interview, observation, performance and other conditions of the trainees, record them in personal record book (See Table 2-10), find factors disturbing learning and signs of disturbed learning and provide assistance for their future. Instructor observe and record behaviors of their trainees during usual classes. If they have some concerns, they provide information to staff specialized in trainee guidance, employment guidance, for example, to reduce the problems.

Table 2-10 Example of Trainee Management Sheet

Trainee			
Basic information			
Name of the contact	Address	Phone number	Remarks
○○○○	○○○○	○○○○	
Emergency contact' name	Address	Phone number	Remarks
○○○○	○○○○	○○○○	
Training situation		Family situation	Interview record

<table>
<tr><td>First term of YY</td><td>Completed all required subjects</td><td rowspan="4">His parents are in divorce litigation and currently separated. He is living with his mother. Any call from the father should not be relayed.
MM/DD</td><td rowspan="4">MM/DD
He needs to become independent early due to parental marital discord. He wishes to work at XX plant in an adjacent town.</td></tr>
<tr><td>Second term of YY</td><td>Failed in ○○ practice and passed after taking supplementary lessons</td></tr>
<tr><td colspan="2">Situation in the institution</td></tr>
<tr><td colspan="2">He is not good at communication and tends to be isolated. The instructor actively calls to him, asks him to come when other trainees are there and encourages him to talk.</td></tr>
</table>

(4) Response to risk

Risks in VT institution are happenings that may occur in the VT course and could explode into a situation in which it is impossible to continue VT. Happenings that make continuation of VT impossible may stem from the trainees, the VT instructors, or the VT institution. Here, we outline risks relating to VT instructors and institutions. Risks relating to trainees will be described in “4.8 Response to Difficulties of Trainees”.

Risks relating to VT instructors and institutions may include the following. It is necessary not only to respond after the occurrence of these happenings but also to develop a plan beforehand of what to do when such happenings occurred and make the plan public while at the same time taking actions to prevent them.

● Risks relating to VT instructors

Ex. crime, disease, injury, family problem, trouble with trainees, harassment, troubles among instructors, discord among managers

● Risks relating to VT institutions

Injury of trainees, complaints from trainees/local community (noise, smoke, gas, bad manners of trainees/instructors), inadequacy/failure of the training environment (ex. building, facilities, weather, electricity, water and sewerage, IT infrastructure), complaint on evaluation of VT projects, legal/rule violation (noncompliance) by staff and other persons involved

If a trainee was injured during a training session, for example, how should we correspond to the situation? The first thing to do is to rescue the trainee. Whom should the instructor contact to do this? How to call an ambulance? Is there a telephone in the workshop? Is it better to use a personal cell phone? If there is no telephone in the workshop, is it necessary to have someone run to the office to make the phone call?

Without prior arrangement of these things, it would take time for an ambulance to arrive and the conditions of the injured person could turn worse. If bungled handling worsened the condition of the trainee, responsibility of the VT institution for the failure of safety management would be investigated. As a result, the institution might be forced to stop training or even close the school.

To prevent this from happening, it is necessary to decide ahead what to do when a trainee is injured. Of course, ensuring a safe instruction method is a prerequisite for operation of a VT institution. It is important that managers decide how to respond to these risks and disseminate the decision to all training executors (see Figure 2-2).

Risk management is conducted to prevent interruption of training which could reduce the efficiency of training.

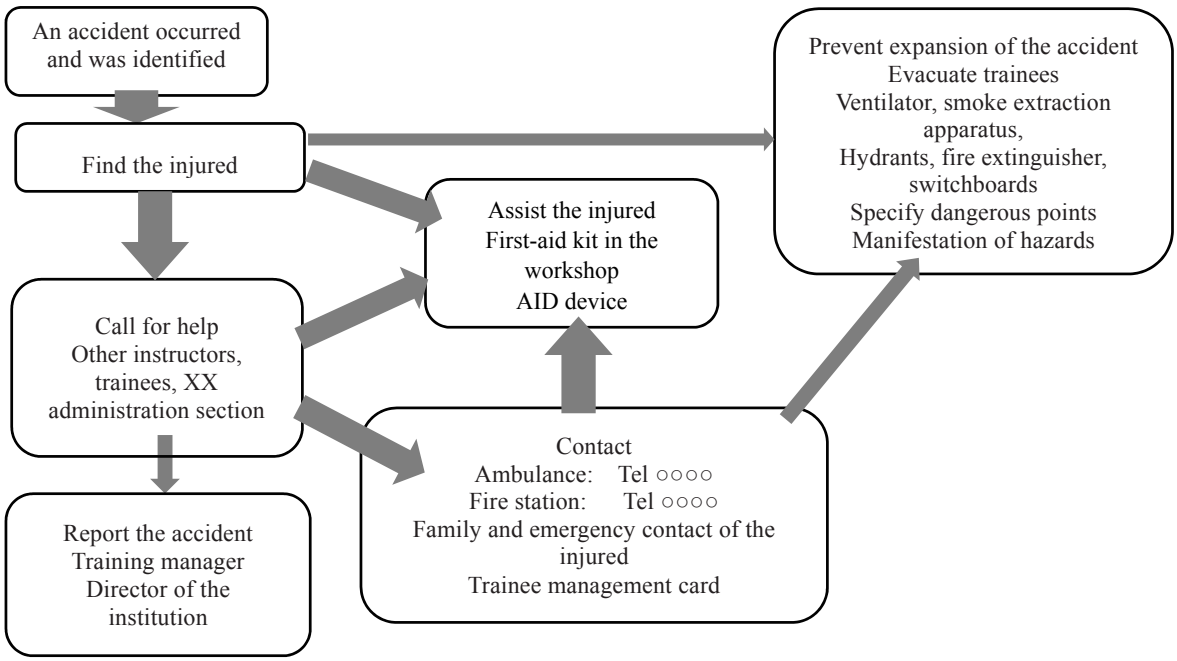


Figure 2-2 Response to Accidents, etc. in a Workshop

Table 2-11 is an example of rules for compliance of an institution. Table 2-12 shows an example of safety patrol to detect unsafe points of facilities. The safety patrol is a system for mutual assessment in which instructors patrol workshops used by other VT course instructor and other places of the facilities once every month, and detect and report unsafe points.

Table 2-11 Example of Rules Concerning Compliance (details omitted)

VT institution Basic Rules for Compliance

(Purpose)

Chapter 1 These Rules establish basic matters concerning compliance of XX VT Institution.

(Definition)

Chapter 2 Compliance means to comply with laws and regulations, rules of XX Organization and norms at the stage of implementing training.

(System)

Chapter 3 Compliance Promotion System

The highest officer to promote compliance in XX Institution is the Director.

Assign a supervisory manager and a promoter. Set up a compliance supervisory council.

Chapter 4 Response to compliance violations

Provide education and training to promote compliance.

Conduct internal audit to prevent compliance violation.

Report happening concerning compliance violation to the promoter and the supervisory manager.

If a person involved detects a happening concerning compliance violation, the person involved shall inform the point of contact. Whistleblowers will not be disclosed and suffer any disadvantage because of the reporting.

If a happening concerning compliance violation is reported, the promoter and the supervisory manager shall investigate the fact.

The supervisory manager shall report to the Director investigation results and provide his opinion on adequate measures.

The Director shall decide a disposition considering the report and opinion of the supervisory manager.

Table 2-12 Example of Safety Patrol Format

Place to patrol			
Date		Patrol person	
Safety issues			
Condition of 4S (seiri, seiton, seiso, seiketsu or Sort, Straighten, Shine, and Sustain)		Things in a high place	
Maintenance situation of equipment and tools		High-pressure, high-temperature, high-voltage or edged places	
Other comments			

(5) Consistency of POCE

A training course with inconsistent POCE may not achieve Attainment objective and training objective. This is neither rational nor efficient because funds are misspent.

Therefore, it is necessary to check the consistency of POCE in the process of planning, design, development and implementation of a training course. Define the point to evaluate POCE of the training course in the form of training design and confirm its consistency. In a form to sort analysis and planning of a training course, for example, confirm whether the purpose of training is adequate for the challenges of society and organizations in terms of the training objective and attainment objective; whether the training objective and attainment objective are consistent with the purpose of training. At the stage of planning, establish the form to check the consistency of the attainment objective, training content and method of each subject. Confirm whether trainees can achieve the attainment objective of the course by achieving the attainment objective of subjects one by one. Also confirm whether the training content and method of each subject will lead to achievement of the attainment objective of the subject.

Formulation of a training course progresses in the order of analysis & planning, design and development. Just before moving from one stage to another, it is advisable to hold a meeting of the managers of the respective stage and the instructor to confirm the consistency of POCE (see Table 2-13).

Table 2-13 Management of Training Course Operation Process

Training course		Instructor responsible for operation	

Operation process	Evaluation item	Implementation	Remarks
Survey VT needs	Hearing survey with industrial bodies (field)		
	Hearing survey with industrial bodies (employment prospect)		
	Local implementation status of education and training		
	Confirmation of technical trends		
	Consensus forming on training needs		
Curriculum design	Consistency with training needs		
	Curriculum that enables trainees to achieve the attainment objective		
	Consensus forming on curriculum		

Preparation for implementation of training	Preparation of a classroom, workshop and equipment		
	Preparation of machines and tools		
	Preparation of raw materials		
	Preparation of training materials		
	Creation of lesson plans		
Implementation of training	Easy-to-understand instruction		
	Instruction that stimulates the motivation of the trainees		
	Evaluation that the trainees have achieved the attainment objective		
Trainee Assistance	Response to difficulty in learning		
	Response to difficulty in placement		
	Response to various challenges facing the trainees		
Evaluation of the course	Satisfaction evaluation		
	Whether the trainees have achieved the attainment objective		
	Whether the trainees utilize their acquired capabilities at work and company satisfaction		
	Are the needs of the trainees satisfied?		
	Was the course rational and efficient?		

Implementation status ○: implemented △: insufficiently implemented ×: not implemented

(6) Training implementation organization

For efficient implementation of training, it is important that VT concerned personnel work together on the implementation of VT.

Suppose that a training planner planned a training course with a certain purpose in mind but his intention is not adequately communicated to the training designer, who designed the training carelessly with cursory interpretation of the purpose.

Again, the person responsible for development developed training materials and practice assignments without correct understanding of the intention of the designer. Not understanding the background, instructor implemented the training with an attitude that his job is simply to explain the content of the given textbook to trainees. In such a case, the trainees would not be able to achieve the attainment objective. Even if they somehow achieve the attainment objective, the training would not suit its purposed planned by.

Therefore, training organizations are required to ensure coordination among personnel and execution of duties based on the expertise of the respective persons in charge.

Implementation of a training course requires: Purpose and objective of the VT are shared in the organization; each person has a clearly defined role and ability to fulfill the role; a strong linkage is formed among roles and they complement each other if where ability is lacking, and; they love their VT jobs and work actively.

Management is needed to ensure that members comprising the organization above are carrying out appropriate activities. Specifically, managers are required to define the role and expected capabilities of each stage and evaluate their capability in some way. In addition, confirm through regular interview and other means whether managers clearly show the purpose and targets of the organization and make them understood to all and individual persons find their job rewarding, for example.

(7) Improvement of VT concerned personnel's capabilities to perform their roles

In order to adequately fulfill respective functions, VT concerned personnel need to have necessary expertise. Lack of expertise will pose an obstacle to rational and efficient implementation of training. Managers are advised to create a

list of capabilities according to their role, position and years of experience to use as a criterion training after employment, personnel assessment, promotion and other purposes. It is important to create such a list for use as a list of capabilities needed in actual work and as a formal or informal criterion for evaluation of VT concerned personnel, and actual use on a daily basis.

Managers evaluate the expertise of VT concerned personnel through regular interviews with them and observation of how they are working every day and record the results in the list of capabilities. Of special importance is the capabilities of VT instructors who implement training (see Table 2-14). Instructors are expected to give easy-to-understand lessons that motivate the trainees to learn and show an attitude to build personal relationships with trainees, for example.

Table 2-14 Training Capability

Item		Check points	Check column
The ability to train others	・Structure of training (scenario)	・Have you made the points of the work clear? ・Have your prepared a scenario? ・Have you proceeded the lesson according to the lesson plan? ・Have you indicated important points in the job breakdown sheet?	
	・Skill of description	・Have you arranged the introduction, presentation, development and summary in a good balance? ・Are the trainees doing work, etc. according to your explanation? ・Are your vocalizing and writing on the whiteboard adequate? ・Is your presentation method adequate?	
	・Understanding of the trainees' comprehension	・Are you pointing out where the problem lies? ・Do you know the understanding degree of the trainees at the end of the training?	
	・Development of training materials (textbook, assignments, slides, models)	・Have you created training materials? ・Are the textbook and other training materials free of errors? ・Are the training materials effective?	
	・Instruction and warning to trainees	・Are you adequately instructing the work to be done by the trainees? ・Aren't there a number of trainees who have nothing to do? ・Are you providing warning and instruction against unsafe actions?	
	・Safety mind	・Do you execute training with safety in mind? ・Do you provide the trainees with explanation about safety?	
Zeal	・Motivation	・Are you always in the workshop (classroom) during the lesson? ・Are you walking around to see how the trainees are working? ・Do you encourage the trainees always?	
	・Enthusiasm	・Do you explain kindly? ・Do you talk to the trainees? ・Are you answering questions also outside of training hours?	
Interpersonal relationship	・Interpersonal relationship	・Is the appearance appropriate? ・Do you say hello? ・Do you do the conversation that accepted the scene? ・Is the volume of voice appropriate? ・Do you take good care of a partner?	

2.4 Actual Evaluation

Previously, consistency of PDCA and POCE has been described. Because the addition of five-level evaluation to this will enable more effective management, this evaluation method will be explained below.

2.4.1 Five levels of VT evaluation

We have presented management items of VT from three respective which are the training objective, training target and rationality/efficiency toward objective of training. This section will introduce a perspective of evaluating VT using five levels (see Table 2-15). The five-level evaluation items supplement the management items presented above.

Table 2-15 Level Evaluation

Level 1: Evaluation of satisfaction	Are the trainees satisfied with the training?
Level 2: Evaluation of achievement Level	Have the trainees achieved the attainment objective set for the training?
Level 3: Evaluation of utilization	Did the graduates use the acquired capabilities at work?
Level 4 : Evaluation of problem solving	Did the trainee succeed in the problem-solving that was the purpose of the training?
Level 5: Cost performance	Does the cost of the training match its result?

Level 1 is an evaluation to check the level of satisfaction of the trainees with the training. It includes questionnaire surveys of satisfaction level. Evaluation items of the satisfaction level survey cover a broad range including the instructor's training method and the training content, but this is an evaluation to check the subjective impression that trainees have received from the training. We can hear what they felt directly through this evaluation.

Then, is a training course with high trainee satisfaction good training? Not necessarily. Suppose some trainees felt that they could learn in an enjoyable way and gave the lesson a high mark in terms of satisfaction level. However, if they cannot get a job, or, even if they have got a job but cannot handle their work, their skill acquirement is insufficient. This is why Level 2 evaluation comes next.

Level 2 is an evaluation to check whether the trainees have achieved the attainment objective. This is checked with theory and practice examinations at the end of the training course and other occasions. Suppose that "capable of welding outside plates of an automobile that is cut for repair (see Figure 2-3)" is set as one of the attainment objective of a car sheet metal training course. If a trainee passes a practice examination to weld a cut outer sheet of a car, he is deemed to have achieved the attainment objective. This is an evaluation that can certify the capability acquired by the trainee.

Then, is it good training if the trainees achieved the attainment objective? We cannot completely say that. What they have acquired through the training could be an old method that is not used at an actual workplace, or they might not able to perfume their roles at an actual workplace with the level of skills they have acquired through the training. So we use Level 3 evaluation next.

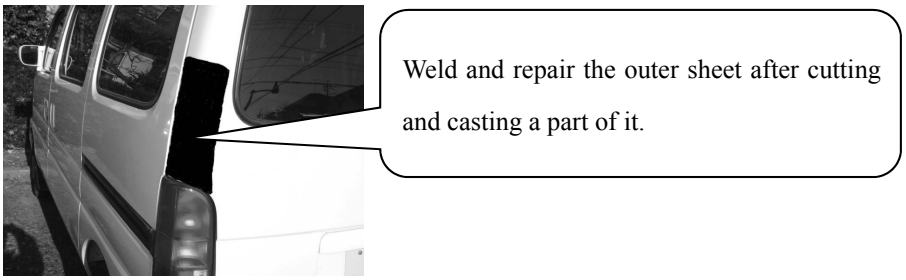


Figure 2-3 Outer Sheet Repair

Level 3 is to evaluate the level of how what had been acquired through the training was used at the workplace. Because it is assumed that VT graduates will get a job or return to their workplace, how much they can use the result of training is evaluated. The evaluation is made from two perspectives.

One is whether what they have acquired through the training is used at their workplace and the other is whether the

capability they acquired through the training is enough to work at the level required at their workplace. These are evaluated by visiting their workplace and interviewing them and their superior what work they are doing at their workplace and using what method, whether the level of the training was adequate, and other information.

After doing the evaluations up to Level 3, you may be able to judge whether the training was good or not. However, even if the trainees can use what they have learned through the training at their workplace, this may not have accomplished the task, which is the purpose of conducting the training. So, it is followed by Level 4 evaluation.

Level 4 is to evaluate whether the problem was solved, which is the purpose of the training. The problem may be to lower a high youth unemployment rate, for example. If the training was conducted to lower a high unemployment rate, to see how much the youth unemployment rate was lowered and by how much the placement rate of the graduates is higher than that of other young people will constitute Level 4 evaluation. After doing the evaluations up to Level 4, you may be able to judge whether the training was good or not. However, the budget and time for implementing good training have their limits. So Level 5 evaluation is carried out to evaluate whether the training is efficient.

At Level 5, it is evaluated whether the intended problem-solving matches the training cost. Evaluate how much it cost to enhance the evaluation of Levels 1 to 4 and whether the cost is adequate. By enhancing the evaluation of Levels 1 to 4 while reducing the cost for implementing the training you can enhance the evaluation of Level 5. This leads to the recognition that VT is necessary for the State and the region.

Each level will be explained in the following sections.

(1) L1 (Level 1): Trainee satisfaction evaluation

Satisfaction evaluation is to evaluate to what extent the trainees are satisfied with the training. The evaluation is carried out in order to find out trainees' dissatisfaction early so that you can prevent their dropping out of the training, improve the training environment and correct poor instruction, for example. There are satisfaction evaluations at the end of individual subjects, those concerning the VT institution at the end of the training and others.

For implementation of a satisfaction evaluation, you need to suppose the expectations of the trainees on the training course. Trainees' expectations on a training course may be roughly divided into: they are able to feel that the training is useful for their future career; it is easy to learn, and the instruction is easy to understand. You can use the question items in Table 2-16 for these categories.

Table 2-16 Example of Evaluation Items of L1

Trainees' expectations	Items of satisfaction evaluation
They are able to feel that the training is useful for their future career	・Do you feel that you are learning training contents? ・Do you feel that you are acquiring the ability necessary for the type of job you hope to get? ・Do you feel that you will be able to get a job? ・Do you feel that the training will be useful at your workplace? ・Do you feel that the money and time you spend are worthwhile?
Easiness to learn	・Is the institution functioning? ・Are there sufficient training materials and functioning tools? ・Is an extreme difference in the trainees' level of the class disturbing the progress of the training? ・Is the class size small enough to receive adequate instruction?
Instruction is easy to understand	・Does the instructor teach in an easy-to-understand manner? ・Are the assignments suitable to your learning? ・Does the instructor have enough expertise in his specialized field? ・Are you in a good personal relationship with the instructor? ・Do you feel you are recognized by the instructor? ・Is the instructor a person you respect?

Trainees do not necessarily have enough understanding of the field in which they are receiving training. If the capability required in the field is very high and therefore the training is very demanding, some may become frustrated with the demanding training. Concentration on increasing the satisfaction of the trainees could lower the evaluation of Levels

2, 3, 4 and 5. In such a case, you should not make compromises for the trainees. Level 1 evaluation has many advantages including that it is simple to implement and enables you to know the opinions of the trainees, but we should not depend on it alone. By developing a questionnaire for satisfaction evaluation (see Table 2-17) common to the whole institution and using it for all subjects, you may find out problems in the way of instruction and instructors who need support.

Table 2-17 Training Evaluation Questionnaire

Understandability of the lesson		Judgment
1	Did the content of the lesson suit your level?	5 4 3 2 1
2	Did you think you have mastered the content of this lesson ?	5 4 3 2 1
3	Was the instructor's explanation easy to understand?	5 4 3 2 1
4	Were the zeal, dress, volume of voice, etc. of the instructor adequate?	5 4 3 2 1
5	Did the instructor make devices to achieve the target by combining theory and practice, for example?	5 4 3 2 1
6	Did the lesson progress as planned?	5 4 3 2 1
7	Were there enough writing on the blackboard, audiovisual materials and handouts necessary for learning?	5 4 3 2 1
8	Were the writing on the blackboard, audiovisual materials and handouts easy to comprehend?	5 4 3 2 1
Describe a scene in which you felt things were easy to comprehend.		
Whether the content of the lesson will be useful for your future career		Judgment
9	Were the attainment objective clearly specified in the lesson?	5 4 3 2 1
10	Was there an explanation of how the learning content would be useful for your future career?	5 4 3 2 1
11	Did you think you have achieved the attainment objective of the lesson?	5 4 3 2 1
12	Did you feel that the learning content will be useful for your future career?	5 4 3 2 1
Describe how you can use what you have learned.		
Whether you find the lesson interesting		Judgment
13	Did you enjoy the lesson?	5 4 3 2 1
14	Was the class arranged to enable you to participate by saying something, practicing, for example?	5 4 3 2 1
15	Did you feel sleepy during lesson?	Yes No
16	If you felt sleepy, mark the three greatest causes among the following. Lack of sleep / Disinterest in the content / Disinterest in the lesson Irrelevant to me / Could not understand the class / The lesson was monotonous	
Describe the reason why you didn't enjoy the lesson.		

(2) L2 (Level 2): Evaluation of attainment level toward the attainment objective

It is evaluated to what degree the trainees achieved the attainment objective of the training. Its concrete content is explained in "2. Examples of management items related to attainment objective" of 2.3.

(3) L3 (Level 3): Evaluation of utilization of training contents

Evaluation of utilization evaluates whether the trainees could use the content mastered through the training at their workplace. As already mentioned, the evaluation has two perspectives: the scope and level of the training. The first perspective is whether what was mastered through the training is used at the workplace. If what has been learned is not used at the workplace, the training missed the point. The purpose of the evaluation from this perspective is to check what kind of technologies and skills are used at work and reflect the results in training contents. The second perspective is whether the capability acquired through the training is sufficient to work at the level required at their workplace. If VT graduates

are unable to proceed actual work after practicing the assignment given to them, they would have a disadvantage in getting a job.

Let's take the skill of repairing a car by cutting its outer sheet and welding the sheet again (Figure 2-3). In the training, trainees practice welding new steel plates that are similar to the outer sheet of a car as purchased from a shop. However, the cut outer sheets that are in actual auto-repair shops are uneven in their thickness and section width due to descaling or other works. The skill of welding new even material to be mastered through the training is ranked low among welding skills and not enough for welding of uneven materials. Utilization evaluation is made to gather information on the level of works carried out at actual workplaces to reflect it in the assignments of the training. Specifically, questionnaire surveys of the companies employing the graduates and hearing surveys of the graduates and their superiors are conducted.

Utilization evaluation may include the survey items shown in Table 2-18. Training contents are reviewed based on the information obtained through the survey. If the works carried out at an actual workplace are not covered in the training, include them. If the level of the training is lower than that at an actual workplace, devise assignments and practice methods for the training to ensure the level and scope required at the workplace.

Table 2-18 Example of Survey Items of Utilization Evaluation

Evaluation perspective	Survey item
Capability to perform at the level required at the workplace (Level)	VT graduates ・Are you continuing to work? ・Could you use what you had acquired through the training at your workplace? (Is what you have acquired through the training valid in the workplace?) ・Are the content and level of the training up to the level necessary at the workplace? Questionnaire for companies (superiors) ・Are the graduates performing at the workplace? ・Is the capability of the graduates up to the level required at the workplace? ・What capability do you expect from future VT graduates?
Whether the content acquired through the training is used at the workplace (scope)	VT graduates ・What kind of work are you doing now? ・What kind of work do you expect to do in the future? Questionnaire for companies (superiors) ・What kind of works are there at the workplace? ・What kind of works will increase?

(4) L4 (Level 4): Evaluation of problem solving

VT is activity to improve the capabilities of people in order to solve problems of society. Evaluation at Levels 2 and 3 evaluates whether the training could improve the capabilities of trainees. At Level 4 we evaluate to what extent the training solved a problem faced by society.

For example, if there are problems of a low skill level and a high youth unemployment rate in the region and VT is planned to solve these problems, you cannot say the intended VT was implemented without solving them. Problems facing society can be roughly classified into those of regions including the central and local governments; those of companies or industrial associations, and those of learners, their parents and other family members which explained in "1.1.2 Problems to solve". You can make Level 4 evaluation of the extent of problem-solving more intelligible by dividing it to evaluation of far-reaching problems affecting the national and local governments and industrial associations, for example, and evaluation of problems affecting smaller communities such as individual companies, families and persons as exemplified in Table 2-19.

Table 2-19 Scope of Problem

	Affected parties	Problem	Evaluation item
Wide	Country, region, industrial associations	High unemployed in the region Shortfall in industrial human resources	Unemployment rate in the region Fill-rate of industrial human resources rate
Narrow	Companies	Unstable quality Shortfall in human resources	Level of quality stability Percentage of secured human resources
	Individual persons	Unemployment Low income	Participation rate Rate of increase in wages

Far-reaching problems will not be improved by efforts of a single VT institution only. For example, suppose that labor force of a region with a population of 300,000 is 150,000 (50%). If its unemployment rate is 5%, 7,500 people are unemployed. In order to lower the unemployment rate by 1%, you need to place 1,500 more people in employment. Can a large VT institution place 1,500 people in employment in one year? If there are multiple VT institutions in the region, it may be necessary to show how much they lowered the unemployment rate of the region in total. The local unemployment rate goes up and down due to various factors. It is advisable to study how to present figures representing the results of a VT institution considering these matters.

A statement such as "XX million among YY million unemployed gained re-employment through some kind of administrative service and VT helped ZZ thousand of them to gain re-employment" would improve public opinion of VT. You may also say "XX% of the graduates of VT institutions gained re-employment while the re-employment rate through other administrative services is YY%".

Solving of problems of a limited range is evaluated by directly asking the graduates of the VT institution and their employers whether their problems are solved. For example, ask the wage of the graduates. You can evaluate the results of the VT institution by comparing the graduates' entrance rate and wage after three years with those of graduates of other educational institutions and workers who did not receive VT.

(5) L5 (Level 5) : Cost performance evaluation

In order to enhance the evaluation of Levels 1 to 4 above, it is necessary to take measures such as improving equipment and employing excellent specialists. However, funds that can be used for VT have their limits. Level 5 cost performance evaluation is made to see whether the cost to enhance the evaluations from Level 1 to 4 is rational and efficient.

You can calculate training cost, for example, cost per trainee, using the method described above in "2.3.3 Management items concerning rationality and efficiency toward objective of training". If the purpose of implementing VT is to reduce social security expense by reducing the number of unemployed, L4 evaluation of problem-solving may be compared with L5 cost performance evaluation as follows.

If an unemployed person gets a job after completing VT, benefits of the trainee, the state and the region include: the amount of administrative cost reduced by the amount of payment and unemployment allowance that would have been paid to the trainee and tax paid by the trainee from his salary. Consider that the effect of the training will continue for multiple years. Examine whether these results are rational and efficient in light of the cost of the training.

If the trainees are expected to obtain large benefits, they may bear the cost of the training. If the State is expected to obtain large benefits, the state may bear the cost and you can evaluate whether it is rational for the state to bear the cost of VT. You can evaluate the efficiency of the training by comparing the result with the placement rate of the graduates. Its rationality may be evaluated through comparison with the rate of graduates who have got a job relevant to the training.

Necessary cost varies depending on the training course. Training in a machinery field requires far more funds to obtain machineries and tools compared with training in clerical service.

In order to ensure safety, you need more instructors per trainee. These points also need attention when comparing multiple training courses.

2.4.2 Reflection of evaluation results in the training course

(1) Response at each level of evaluation

Feed back the results of evaluation from Levels 1 to 5 to all concerned personnel. Concerned personnel develop

improvement proposals, carry out concrete activities for improvement and execute the next training course. Below is the way of improvement for a training course after evaluations from Levels 1 to 4.

In Level 1 evaluation of satisfaction, if a number of trainees say that the progress of the training course is impeded because the trainees in the class are at various levels, remedies may include: dividing the class into different levels in the next training or implementing an entrance examination to ensure a certain level of trainees.

In the evaluation of class implementation, if many of the trainees state that the class is not easy to comprehend, remedies may include observing the class of the instructor, proposing improvement of parts found difficult to understand and encouraging improvement.

In Level 2 Evaluation of the attainment level toward the attainment objective, if many of the trainees have not achieved the objective, this may be because they lack sufficient ability to learn the training content or the instruction is not adequate. If the trainees lack sufficient ability, possible measures include: improving the entrance examination to select trainees who have adequate learning ability or lowering the attainment objective of the training. However, if the attainment objective is lowered, the graduates may not become capable of showing the capability required at their future workplace. If the entrance exam is made more difficult, the course might not have the intended number of trainees. It may be unreasonable to implement such a training course from the beginning. In such a case, it may be necessary to narrow the scope of the training so that the trainees can concentrate their ability or extend the training duration rather than lowering the level. Another option is to change the design of the training from learning a certain professional skill to get a job to developing basic capability to enter an apprenticeship. If the instruction is not adequate, possible measures include changing the instructor, having the instructor undergo training to improve his training capability and giving instruction under the guidance of his superior.

In Level 3 Evaluation of utilization of the training content, if it is found that the training content is not used at the workplace, the following measures may be considered. Identify what skills and operations are used at the workplace and add them to the training. If the training hours are not sufficient to do this, eliminate training contents that are not used at the workplace. In this process, it is necessary before eliminating them to consider whether the skills and operations are included in a national VT Standard or constitute the foundation of more practical skills. Even when they are included in a national standard, if they are not used at any workplace across the country, it would be necessary to work on the change of the standard.

In Level 4 Evaluation of problem-solving, the following example may be considered. The purpose of a training course was to help young people acquire capability necessary for a certain occupation and get a job, but it was difficult to get a job even for the trainees who completed the training with a good grade. In such a case, it is necessary to find out the reason why they could not get a job. If this is because the area has few workplaces in which the graduates can use the training content and experienced workers are given priority in employment at these workplaces, you may close the training course considering that training in this field is not needed in the area, or you may lobby the industry to fill the small number of available positions with the graduates. Confirm what kind of human resources are needed through close consultation with companies and industry associations relevant to the training content, promise that only the graduates who have the needed capabilities will apply for the job and ask to make a job offer (order from work) first to the VT institution. If a trusting relationship is built between companies and the VT institution, graduates of the VT institutions will be given priority in employment.

(2) Evaluation by combination of multiple levels

It is also possible to make evaluation by combining multiple levels. Figure 2-4 is evaluation that combines Levels 1, 4 and 5 with the trainee fill rate of the training course on the vertical axis and satisfaction evaluation on the vertical axis. Evaluation results of implemented training courses are plotted in Figure 2-4 to show the status of each course. This is an application of the concept of PPM (Product Portfolio Management) that examines product lifecycle.

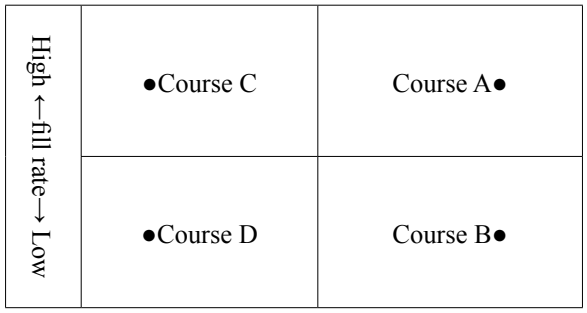


Figure 2-4 Evaluation Method

Course A is an excellent course with a high satisfaction level and fill rate. It is hoped to maintain this condition. Course B enjoys a high satisfaction level but its fill rate is low. Why is its fill rate low in spite of the high evaluation of its content and instruction method? There may be factors other than the quality of the training; lack of training needs in the region or insufficient public advertisement for example.

Course C is the worst case for a VT institution. Its satisfaction is low whereas its fill rate is high. Bad publicity of the training courses of the VT institution could spread from the large number of trainees and damage the reputation of the institution. It is necessary to improve the training content and method to increase the satisfaction as quickly as possible.

Both satisfaction and the fill rate are low with Course D. You should consider closing the course unless the course is the first attempt of the kind or otherwise has an exceptionally high potential. If the course has potential, improve its training contents and method to place at the position of Course B with high satisfaction. Next, strengthen publicity campaigns to raise its fill rate. If the publicity campaign jumped the gun and only the fill rate is raised, it would end up placing the course at the position of Course C spreading bad publicity.

PPM evaluation is a good method for comparing a number of training courses contents and identifying those that modification is needed. If a course is found to need attention, check what evaluation is given to it at each level and consider concrete measures for individual problems.

2.5 Training Management System and Evaluation Plan

2.5.1 Management system

Management of training involves evaluating training at various levels, finding problems, developing concrete measures to improve them and having VT concerned personnel implement them. In order to enhance the outcome of training, it is necessary to examine whether the management is implemented adequately. Perspectives of management system evaluation can be roughly divided into three groups. The first is whether evaluation items are collected, the second is whether improvement suggestions are extracted from them, and the third is whether the improvement suggestions are adopted. Evaluate whether the respective responsible persons are executing them on a timely basis.

For evaluation of this training management system, it is necessary to decide beforehand the schedule and workflow of who are to collect what evaluation items of Levels 1 to 5 and when, how to handle them, to whom to report, who will draft improvement suggestions based on the report, and how to develop them into definite plans and reflect the results in the next training. It is the role of the person in charge of training management to decide such schedule and workflow and ensure their implementation.

2.5.2 Evaluation plan and workflow

Evaluation should be conducted not haphazardly but systematically and continuously. To this purpose, annual operations planning of a VT institution should incorporate an improvement plan. For this, divide evaluation into that of each training course and that of the VT activity First, an example of an evaluation plan for a one-year training course is shown below (Table 2-20).

Table 2-20 Annual Evaluation Plan for Training Course

<table>
<tr><th>Evaluation items</th><th>First quarter</th><th>Second quarter</th><th>Third quarter</th><th>Fourth quarter</th></tr>
<tr><td>Trainees</td><td>Evaluation of attainment level of trainees by the instructor of each subject</td><td>Reporting evaluation results to HOD (Head of department)</td><td>Reporting from HOD to the Director</td><td>Director issues evaluation report</td></tr>
<tr><td rowspan="2">Training Course</td><td>Evaluation of satisfaction by instructor of each subject
Cost Balance of training</td><td colspan="2">Reporting satisfaction evaluation result to HOD
Reporting the budget implementation status to HOD
Situation report from HOD to the Director</td><td>Training method is improved by the instructors of the respective training subjects
Reviewing the budget</td></tr>
<tr><td>Hearing survey of VT graduates and employers by instructors Utilization of the training
Problem-solving performance</td><td>Instructors sort survey results
Reporting to HOD</td><td>Drafting improvement plan by instructor
Reporting to HOD
The chief of the training section make adjustment between training subjects
Situation report from HOD to Director</td><td>Decision on the improvement plan of the training course of the next year
Approval by the Director and HOD</td></tr>
</table>

Here is an example of evaluation plan of a VT institution that provides multiple training courses as described above (see Table 2-21).

Table 2-21 Annual VT Institution Activity for Evaluation Plan

<table>
<tr><th>Evaluation items</th><th>First quarter</th><th>Second quarter</th><th>Third quarter</th><th>Fourth quarter</th></tr>
<tr><td>Trainee</td><td colspan="3">・Instructors record subject pass situations of each trainee
・Assistance is provided to trainees who have not taken courses as planned
・Reporting to HOD
・Reporting from HOD to the Director</td><td>・Director issues report cards</td></tr>
<tr><td rowspan="3">Training course</td><td colspan="3">・Summarizing satisfaction evaluation of each instructor
・Reporting to HOD</td><td rowspan="2"></td></tr>
<tr><td colspan="2">・Summarization of budget implementation status of each training course
・Reporting to HOD</td><td>・Detection of inadequate instructors and instruction needing correction by HOD
・HOD orders to adjust budget implementation</td></tr>
<tr><td>・Instructors are ordered to conduct hearing survey of VT graduates and their employers.</td><td>・HOD summarizes evaluation results
・Order to the instructors to develop improvement suggestions for training course.</td><td>・HOD summarizes improvement suggestions for training course.
・Decision on the training implementation/ improvement of the next year
・Reporting to and approval by the Director</td><td>・HOD orders to revise training contents
・Reflection in the recruitment guide
・Preparation of annual report</td></tr>
</table>

The evaluation plan for training course (Table 2-20) and the VT institution activity for evaluation plan (Table 2-21) above are interlocked. Evaluation results of individual training courses are summarized and improvement of all training courses is ordered and implemented based on this. An evaluation plan schedules evaluation this way while determining the roles of each party.

Let's look at evaluation of trainees, for example. See whether the trainees of the training course have achieved the attainment objective and successfully passed in individual training subjects. The subject passing situation is summarized periodically from the perspective of the whole institution. If any of the trainees have not passed subjects as planned, guidance will be provided in cooperation with the instructor to take supplementary lessons or the same subject again. If any trainees are not performing well, check for factors interfering with learning and think about countermeasures. If trainees accomplished the predetermined result, give them a report card, a certificate of completion and qualifications.

With respect to training courses, satisfaction with each training subject is evaluated. The results are summarized at the end of every half-year or quarter. Identify items with high trainee satisfaction and those with low satisfaction to use as information for the training environment improvement conducted by the VT institution. If there are instructors who have a very low rating by trainees, check for their conditions and give an instruction for improvement where necessary.

Conduct hearing surveys of the VT graduates and their employers concerning the training course. Collect information on whether the contents of the training course are used at the workplace, whether problems of the workplace are solved by using them, the placement rate of the graduates, and the cost of operating the training course, for example. Summarizing and analyzing the corrected information, you will consider whether to implement the course next year again, to improve or to add new contents in preparation for implementation in the next year.

It is advisable to compile the collected evaluation results and the improvement for the next year into an annual report and send it to the division supervising the VT in the region and to the local industry parties. Improvement suggestions presented together with their reasons will serve as documents when making budget requests. The local industry will increase expectations on VT and provide useful information about VT needs.

This way, evaluations together with utilization of evaluation results will fulfill an important role in maintaining and developing VT, if they are implemented continuously and systematically.

Chapter 3 Setting Up a VT Course

3.1 Training Needs and VT Course

3.1.1 Training needs = problems of society

The training need is the demand for setting up a new VT course. The necessity to set up a VT course arises because some problem exists. For example, if companies want to employ people with certain abilities but find no applicants, this is a problem. If job seekers are not employed for the reason that they lack sufficient ability, this is also a problem. Increase in welfare and medical costs and social costs to address worsening security due to a large number of unemployed people in the region is a problem for the local government.

Thus, it is considered necessary to set up VT courses to improve the abilities of job seekers to solve these problems. The need to solve problems of society is at the basis of training needs.

3.1.2 Source of the training needs (local governments, companies (associations), individual persons, and families)

Parties who have training needs can be classified into the three levels of (1) individuals and families, (2) companies and associations of employers, and (3) central and local governments.

Individual's training needs, if they are unemployed, are likely to be to acquire the skills necessary to get a desired job, or, if they are employed, to acquire the skills necessary to improve their position in the workplace and their job security.

Training needs of companies and associations of employers are likely to be to employ applicants with high skill levels and have their employees acquire the skill levels necessary to ensure high productivity.

Training needs of central and local governments are likely to be to promote industry, attract companies and ensure the security of the livelihoods of residents, for example. When designing a VT course, it is necessary to consider training needs at the levels of the above three parties.

3.1.3 Identification of concerned personnel and their expectations

Training needs at the three levels mentioned in the previous section may conflict with each other. For example, if Company A expects specific techniques and skills, it would demand a training plan focused on the techniques and skills. However, if the techniques and skills are specific to Company A, graduates from the course can't use them at other companies. Companies B and C may not employ them.

If a trainee's need is not to get a job with Company A but to get a job with any of Companies A, B and C, the VT course will not meet their need.

If a VT course is funded by the government, it is not allowed to plan a VT course specializing in getting graduates a job with Company A considering the need for fairness to other companies that also wish to employ competent applicants. When setting up a VT course, it is necessary to coordinate interests of the concerned personnel and clearly specify the result as the purpose of the course at its planning stage. Especially, public organizations planning a VT course should respect the interests of all concerned personnel.

3.1.4 Procedure of setting up a VT course

Planning and designing a VT course are based on the training needs. A VT course is successful if it attracts a large number of applicants and its graduates and the other concerned personnel who wanted to set up the course enjoy the benefits that are the purpose of the course. For the success of a VT course, it is necessary to plan and design a VT course based on the training needs. Below, we will organize the main points of grasping training needs and planning and designing a VT course.

(1) Grasping training needs

Training needs represent the demand for setting up a VT course. Training needs are expressed in terms of their purpose, training content and recipients. The purpose of setting up a VT course is to solve problems in society. The need to solve problems such as a lack of human resources in a certain job category and the inability of school graduates to get a job are motivators for setting up a VT course. If the problem is expected to be solvable by enhancing the ability of trainees, a VT course is set up.

Training content is expressed with the techniques and skills necessary to solve the problem. For example, if a VT

course is set up to solve the problem of a shortage of human resources in a certain job category, its content is the techniques and skills making up the ability necessary to work in that category.

Recipients of the training are persons eligible for the course, or companies that want to employ graduates from the course or have their employees take the course, for example. You need information on the expected number of trainees in the commutable area, possible workplaces for graduates from the VT course, and also regarding how long the demand for the course will continue.

Works to grasp training needs are also works to accumulate "evidence" that a VT course in accordance with the purpose, content and recipients described above will be successful.

(2) Planning a VT course

VT course planning is based on the training needs. Planning of a VT course is the work to decide the policy on how far to respond to the training needs, giving consideration to the resources of the VT institution. This means that planning a VT course defines the purpose, contents and recipients of the training on a realistic basis.

Specifically, the outcome objectives of the training are defined in accordance with the purpose of setting up the VT course and its recipients, while the outline of the attainment objectives for trainees is defined in accordance with the training content. The outline of resources (human resources, material resources, and financial resources) of the VT institution is also defined and the resources are used for implementing the training.

For example, if there is training need: shortage of human resources in job category X in a certain area, a training plan may be displayed as in Table 3-1.

Table 3-1 Example of VT Course Planning

Course name	Human resource development course of job category X in area Y
Training purpose	Eliminate the shortage of human resources in job category X in area Y
Outcome objectives	Percentage of available training slots filled: xx% Course completion rate: xx% Achievement rate of the attainment objective: xx% Graduates' employment rate in job category X in area Y: xx% Percentage the training course graduates represent of all persons employed in job category X in area Y: xx%
Attainment objective	Capable of the work necessary for job category X
Training duration	X years
Training admittance capacity	xx trainees/year
Persons in charge	○○, ○○, ○○
Facilities to be used	Classroom X, Workshop Y

(3) Design of VT course

Designing a VT course to accomplish its outcome objectives and attainment objectives is based on the planning. Designing a VT course is a process of planning concrete procedures to accomplish its objectives.

For example, in order to achieve one of the outcome objectives, "Percentage of available training slots filled: xx%", plan how to inform the training contents to the group of eligible persons identified when grasping the training needs and to a set of companies that is expected to employ graduates from VT course. Also, plan the training method including the training subjects, contents, lectures, practices and appropriate timing to help trainees achieve their attainment objectives.

3.1.5 Roles of the VT course

The relationship between training needs and the VT course is illustrated in Table 3-2. Set outcome objectives and attainment objectives based on the training needs, and design and implement a VT course that will realize them. If the training is implemented as designed, trainees will achieve the attainment objectives of the VT course. At the same time, part of the outcome objectives, the course completion rate and achievement rate of the attainment objective, will also be achieved. As a result, the high quality of the graduates from VT course is appreciated by companies, which leads to the achievement of the employment rate and the target share of the graduates in the job category that are also outcome

objectives. A training course producing such good results will gain popularity, attract an increased number of trainees and achieve the target rate of the percentage of available training slots filled.

Table 3-2 Relationship Between Training Needs and VT Course

	Planning and design of a VT course	Result of implementing the VT course
Training purpose (needs)	Eliminate the shortage of human resources in job category X in area Y	The shortage of human resources in job category X in area Y is eliminated.
	↓	↑
Outcome objectives	Percentage of available training slots filled: xx% Course completion rate : xx% Achievement rate of the attainment objective: xx% Employment rate of graduates from VT course in job category X in area Y: xx% Share the graduates from VT course represent of all persons employed in job category X in area Y: xx%	The course has a reputation for helping employment and attained a percentage of available training slots filled of xx% Appropriate training method led to attainment of a course completion rate of xx% and xx% achievement rate of the attainment objective The high quality graduates from VT course have a good reputation leading to the attainment of the target, employment rate of graduates from VT course in job category X in area Y: xx% Attained the target, share of the graduates from VT course: xx%
	↓	↑
Attainment objective	Capable of the work necessary for job category X	Capable of the work necessary for job category X
	↓	↑
	Implementing the VT course	

Such a virtuous circle will be realized if training needs are correctly grasped and the training course is planned and designed to meet the needs.

Such a circle will not be realized if there is no training need. Even if there are training needs, the target employment rate and the share of graduates from VT course in the job category will not be attained if the graduates do not achieve the attainment objectives or the objectives are inconsistent with the training needs. As a result, the VT course will be judged to be unable to eliminate the shortage of human resources in the region, or, in other words, it will be judged not to meet the training needs, and will be discontinued.

This way, a VT course can continue by playing a role to solve problems of the training needs, that is to say, problems of society. A VT course that is not able to solve problems will be eliminated.

3.1.6 Coordination with related measures

VT is operated together with various measures and systems. They include systems to set the standard of vocational abilities, qualification systems, systems to set training standards and methods, and subsidy systems for training. When setting up a VT course, it is necessary to ensure coordination with these measures and systems.

For example, if the government has a vocational qualification system and the qualification gives an advantage for employment, it will be rational to plan VT to acquire the qualification. If practical experience is required to acquire the qualifications, it is necessary to make a flexible plan by setting a period for the required practice in the VT. When the VT system does not allow training outside of the VT institution, it is necessary to ensure attainment of experience that qualifies as practical experience.

On the other hand, if it is mandatory in VT to acquire a qualification that has become obsolete and does not provide much advantage for employment, and improvement of the qualification system is not expected, it is necessary to plan the content of VT to meet the actual training needs within the limit allowed by the system.

You should not plan or design a VT course that does not meet the training needs while placing the blame on inadequate measures/systems. It is necessary to plan and design VT courses that will achieve their outcome objectives and attainment objectives by coordinating the demands among the three levels of training needs, measures and systems.

3.2 Survey of Training Needs and Planning of a VT Course

3.2.1 Survey and analysis of training needs

(1) Procedure of training needs survey

Training needs surveys are carried out to check for the needs for new training or to improve the existing VT course by investigating the environment surrounding VT including industry and factories. They are also carried out to collect information that will be helpful at the stage of designing a new VT course (the stage to decide the amount of training (number of trainees), eligible person of the training, required training duration, training objectives, etc.).

The scale of the survey varies depending on the purpose. When establishing a new VT institution, a large-scale survey will be carried out taking considerable time. When a VT instructor conducts a survey to set up a new up-grading VT course for employed workers, there will be a small-scale survey. The general flow of the training needs survey procedure is shown below. Some steps of the procedure may be skipped depending on the scale of the survey.

Procedure of training needs survey:

①Constructing a hypothesis: In order to avoid disorderly searching through unlimited information, a survey is generally carried out based on some predictions. It is expected that predicting the outcome and constructing a hypothesis will make the survey effective.

The content of a hypothesis can be as follows. It is necessary at least to define what training is deemed necessary and why.

What? ..... assumed training
Why? ..... reasons that make the training necessary (e.g. issues in industry)
To whom? ..... persons eligible for the training
How much? .... necessary amount of training (necessary number of trained workers)

②Considering the survey items: The purpose of the survey is to check the facts to see whether the hypothesis is valid or not. You can ensure a precise survey by making a list of survey items to check in order to identify the facts.

③Considering the survey method: Decide for each survey item whom to ask and in what way. Typical survey methods are literature searches, questionnaire surveys and hearing surveys. Naturally, multiple survey methods may be used for one survey item.

④Creating survey forms: It is necessary to create survey forms in order to check every survey item, and also to obtain the target information if more than two persons divide the survey work. Create a literature list for literature searches and questionnaires for hearing and questionnaire surveys.

⑤Implementing the survey: You should study the survey schedule, totaling method, survey costs, etc. beforehand to ensure efficient and systematic implementation. When a large number of people conduct a large-scale survey, you may need a survey implementation guide (survey manual).

⑥Analyzing the survey result: Make graphs and tables of the data obtained through the survey and examine the trends. First, an analysis is made to check whether the hypothesis is valid. Next, an analysis is made to look for training needs other than those assumed in the hypothesis. If you look at the data assuming that the hypothesis is valid, you may sometimes fail to recognize the real situation. Compile answers to the hypothesis and accompanying opinions by impartially handling all opinions, including positive, negative ones.

(2) Survey methods of training needs

Typical survey methods of training needs are literature searches, questionnaire surveys and hearing surveys. Targets of a training needs survey are assumed to be the levels of individuals, companies and associations, and central and local governments indicated in “3.1.2 Source of the training needs”. Identify training needs at each level making full use of the three survey methods.

①Literature search

Literature search is the work to extract information on training needs from past reports, statistical data and other information. You can grasp major trends of various industries, labor supply and demand, technology progress, etc. It is recommended to regularly look over a variety of information as part of training needs survey.

For example, the information on labor supply and demand balance by industry in individual prefectures is published every month. VT institution personnel always check the above information.

②Questionnaire survey

A questionnaire survey enables a general survey targeted at a large number of business establishments. It often fails to obtain precise information but helps acquire useful information for planning a VT course as long as the survey targets and questions are relevant.

③Hearing survey

It is difficult to gather a large amount of information with a hearing survey but you can obtain precise information. However, if you depend on a hearing survey alone, the result could depend on the prejudicial opinions of some parties.

Because there is no perfect method for a needs survey, it is necessary to combine the three methods mentioned above. It is important to prepare a hypothesis on the training needs described in the previous section and work to back it up. It is preferable for a hypothesis on training needs to have a story (need of training → providing of training → operational effect) as shown in Table 3-2. The essence of a training needs survey is in backing up and/or correcting the story set as a hypothesis.

In VT practice in Japan, upgrading VT for workers are planned and implemented by individual VT instructors in most cases. In order to raise awareness of individual VT instructors about the importance of needs for upgrading VT for workers, the following two questions are often used:

→ What are the "troubles" in companies and professional activities?

→ What "benefits" will trainees gain through implementation of the new training course?

3.2.2 Setting up a VT course

Setting up a VT course means planning a training course based on the identified training needs as described in "3.1.4 Procedure of setting up a VT course, (2) Planning a VT course". When the planned VT course (or revision of an existing VT course) is approved, design of the VT course will start. Key words for setting up a course are organized in the next table.

Table 3-3 Key Words of Setting Up a Course

Item	Key word
Course name	If a book is used, course name corresponds to the title of the book ● Abilities for job category and duties covered by the training (e.g. electric work, automobile maintenance) ● Training level (e.g. basic, intermediate) ● Training duration (e.g. long-term, short-term), etc.
Training purpose (needs)	* Training needs and expectations from the implementation of the VT course ● Background and needs of setting up the training course ● Purpose of setting up the VT course (expected effects), etc. Example: Eliminate the shortage of human resources in job category X in area Y
Outcome objectives	*Indicators to measure the achievement of the training purpose and the target value ● Achievement rate of the attainment objective: xx% (e.g. skill level) ● Employment rate of graduates from VT course in job category X in area Y: xx% ● Share of the graduates from VT course represented in all persons employed in job category X in area Y: xx% In addition, percentage of available training slots filled : xx%; course completion rate: xx%, etc.
Attainment objective	● Vocational ability to be acquired when the training is completed ● Example: Become capable of X work, Y work necessary for job category Z.
Training duration	● Days required for the training ● Total training hours ● Timing to start the course, etc.
Training admittance capacity	● Number of trainees per session/intake ● Number of training sessions/intake per year ● Long-term VT planning (e.g. total number of graduates for 5 years)
Persons in charge	● Preparer of the training curriculum ● Persons in charge of instruction ● Persons in charge of trainee assistance ● Evaluators of training results, etc.
Facilities to be used	● Classrooms, workshops ● Major training facility & equipment, etc.

3.3 Design of the VT Course 1

3.3.1 Setting outcome objectives of the VT course

(1) Approaches for setting training objectives

As the introduction to Chapter 1 clearly indicates, the purpose of Japan's public VT is defined by the law as "to promote the development and improvement of the skills workers need for their jobs…and thereby to ensure employment security and improvement of the status of workers". In other words, the purposes of VT in Japan are to help those who receive the training to find jobs, and to help employed workers to get better treatment after receiving the upgrading VT for employed workers. A close examination of the current state of affairs shows that a variety of VT courses for specific purposes are offered in Japan. Each VT course assumes a class of eligible persons – new graduates from school, unemployed workers, and employed workers in companies – and the outcomes required for the training course differ depending on the VT courses, such as finding jobs, resolving issues of a company, and so on. By the same token, expectations placed on the VT courses differ from country to country, from region to region, and according to the various circumstances of the times.

It is important to describe expected concrete outcome in written or numerical targets when you set up objectives of VT courses in the view of above-mentioned activities.

(2) Setting training objectives

Training objectives are classified into two categories – see "2.2 Management Perspective" – i.e. (1) the objectives for achieving the purpose of setting up the VT course, and (2) the capacity improvement objectives for the trainees attending the VT course (attainment objectives).

In this section, a brief introduction is made of the objective setting approach relevant to the former training category (i.e.(1)). As for the approach relevant to the latter category (i.e. attainment objectives), see the description in "3.3.3 Setting attainment objective of graduates from VT course corresponding with purpose and outcome objective of the VT course".

To achieve training objective of VT course is to meet training needs in other words. Therefore it is important to describe training objective with consciousness of training needs.

Here is an example to explain how to set up VT course objectives in detail.

> Region A in the watershed of the Mekong is predominantly a farming area, and the medium-term development plan established by the local government relies heavily on the robust growth of rice production to achieve the projected economic development. As a means to achieve this goal, extensive mechanization is needed for cultivating the vast arable land. In response to this, the Mekong Vocational Training Junior College is planning to establish a two-year agricultural machinery operation/maintenance training course for high school graduates.

The objective of the VT course is to provide human resources that help to extend the use of agricultural machinery. In the planning process for such VT course, you should analyze the projected number of person to be employed as agricultural machinery maintenance personnel as a first step. Then consider how many graduates should be trained to fulfill this potential employment annually. This is the number of available training slots. It should be a part of the course objective, thus the training objective is described as the following example.

①Training objective (1): 90% of trainees successfully pass the final examination and complete the VT course.

Here, if the number of slots available for the full training is 20, two trainees (10%) are assumed to drop out without completing the course. In the case where the priority is placed on supplying the scheduled number of graduates from the VT course to the labor market, a possible option is to enroll a larger number of applicants than the full quota – 10 to 20% larger in this case. A possible scenario in this situation includes the case where the course enrolls a maximum of 24 trainees, in which case the facilities and environmental conditions must be prepared accordingly to implement trainings without compromising their quality.

If the training contents satisfy eligibility requirements for national qualification examinations, the passing rate can be a training objective.

②Training objective (2): More than 70% of the graduates from the VT course can find a job in the local labor market.

Although the main objective for setting up the VT course is to provide human resources that help mechanize local agriculture, it should be noted that the needs for such human resources are common to the five countries that share Mekong watersheds for agriculture. If a graduate from the VT course wishes to work in other countries, his/her wish cannot be rightly denied.

③Training objective (3): More than 60% of graduates from the VT course find a workplace where they can practice skills in agricultural machinery maintenance.

It is expected that the graduates from the VT course will use their skills in agricultural machinery maintenance in local enterprises or family farming businesses, or in related fields such as car repair shops.

However, there are a non-negligible number of cases where they do not fully exploit their skills in agricultural machinery maintenance by their own request, or according to the direction from their employers.

If employer changes the graduate's work duties due to a low opinion of his/her ability ascribed to insufficient training contents or training hours, you must improve training program immediately.

3.3.2 Evaluation plan of the VT course

The criteria for the evaluation of the VT course heavily depend on the objective settings described above. Some aspects of the evaluation methods, timing and evaluation outcomes are described below, as well as some specific examples of evaluation criteria.

①Evaluation criteria (1): Did 90% of graduates from VT course pass the final examination?

In a long-term training course for those who newly graduated from high school, it is usual to conduct tests at the end of each semester to evaluate the knowledge, levels of understanding and skill acquired in each subject. In addition, a practical test is conducted at the end of the training course to asses that course recipients have reached the attainment objectives (those eligible for this test must have met some qualifications such as achievement in semester tests and attendance rate). A number of factors have an effect on the result of these evaluations, including the effectiveness of training hours, training method, training environment, training materials and others allocated for attainment objectives and training subjects set in the two-year curriculum of the Mekong Vocational Training Junior College. Other important factors that affect the evaluation results include trainees' attendance and their motivation for taking trainings, as well as the guidance in daily life given to them by VT instructors.

②Evaluation criteria (2): Did more than 70% of graduates from VT course find a job in the local labor market?

In view of the training needs propounded by Mekong Vocational Training Junior College's agricultural machinery maintenance course – i.e. "Enhanced rice production through mechanization of agriculture leading to local economy development" – finding jobs within the targeted region is naturally an indicator of importance to evaluate the effectiveness of the course. Therefore, to the extent possible, a measure is needed to induce those students who wish to find a job locally to apply to the college training course. In Polytechnic Junior Colleges in Japan, as a measure to expand enrollment for the next year, VT instructors visit high schools to give detailed information on the training course (program features, employment information, etc.) to the high school's career guidance officers. The main objective is to expand the number of those interested in the training course, and thus enables enrolling those students selectively who are most likely to meet the training needs.

③Evaluation criteria (3): Did more than 60% of graduates from VT course practice skills in agricultural machinery maintenance at the workplace?

The typical work and workplaces considered suitable for agricultural maintenance engineers include: repair shops and sales departments of agricultural machinery manufacturers/dealers, farming plants (offspring planning to take over the family business), car repair shops (in particular, maintenance of diesel engines), agricultural training officers affiliated with farmers cooperatives and related organizations, and research and development institutions in agriculture-related areas. The training program is considered passable if the trainees find jobs in these workplaces or fields. On the other hand, in the case of employment in other job categories such as office clerks and delivery service (due to personal or organizational reasons), it is considered that the training program has not met the training needs properly. To reduce the latter cases, fact-finding studies and measures to improve the situation are needed through building continuous communication between the VT

instructors and graduates from the VT course and collaboration with the enterprises.

④Evaluation criteria (4): Were more than 60% of the employers satisfied with the abilities of graduates from the VT course as a maintenance engineer?

Finding employment is one thing, but whether or not the employers were satisfied regarding the employment of the graduates from the VT course is another important evaluation criterion. Not only the individual graduates, but also the entire curriculum of Mekong Vocational Training Junior College, including the instructors, training environment and training materials will be evaluated. These evaluation criteria have a significant weight if the VT course is to provide graduates every year to large enterprises and organizations.

The attainment objectives of trainees explained in the next section are important elements in gaining a high evaluation.

3.3.3 Setting attainment objective of graduates from VT course corresponding with purpose and outcome objective of the VT course

Let us recapitulate the simulation of the agricultural machinery maintenance course in Mekong Vocational Training Junior College to explain attainment objective settings for the graduates from the VT course. The results of needs surveys conducted prior to setting up the course play an important role for setting attainment objectives. These include surveys on equipment and farming implements used in the farming areas that have a track record of successful mechanization, as well as on the remaining issues at hand. Surveys for job analysis – e.g. gathering technical needs for agricultural machine operation/maintenance/repair – should also be carried out. Based on these results, attainment objectives – training contents that a trainee should acquire before he/she completes the VT course – are set as below.

Attainment objective 1): Capable of overhauling agricultural machine engines
Attainment objective 2): Capable of maintaining lubrication systems in agricultural machines
Attainment objective 3): Capable of maintaining brake systems in agricultural machines
Attainment objective 4): Capable of maintaining fuel injection systems in agricultural machines
Attainment objective 5): Capable of maintaining cooling equipment in agricultural machines
Attainment objective 6): Capable of maintaining electric systems in agricultural machines
Attainment objective 7): Capable of maintaining hydraulic systems in agricultural machines
Attainment objective 8): Capable of maintaining steering systems in agricultural machines
Attainment objective 9): Capable of maintaining various attachments

3.4 Design of the VT Course 2

3.4.1 Setting the training plan (curriculum) for the trainees to achieve their attainment objectives

The elements to be included in the training plan for optimum attainment objectives of a VT course are broadly classified into two categories: training content and method. In this section, the former element, training content, is reviewed. A variety of nominal designations are used to describe the aspects of training content including: subject, training subject, details of the subject, unit, element (breakdown of a subject), training item, etc. In a broad way, these designations come from the training plans and describe the training details from a somewhat different viewpoint. The training content can be described using attainment objectives and training items. The following is an illustrative explanation concerning how to use the designations to properly describe the differences of training content according to the difference of the details in which a forestry training course, typically running for a month, is used as an example.

● Training contents of a one-month forestry training course

Course name	Practical silviculture one-month course
Attainment objective	Capable of practicing silviculture
Subject (unit)	1 Pruning 2 Climber cutting 3 Mowing underbrush

● The subject (unit) "3 Mowing underbrush" above, slated to take a week, can be further broken down and described as follows.

Subject (unit)	Mowing underbrush
Attainment objective	Capable of mowing underbrush
Breakdown of a subject (elements)	1 Clothes and protect gear for safe mowing 2 Handling of bush cutter 3 How to harness a bush cutter 4 Practices of safe mowing

● Assuming that the subject is completed in a week, detailed content of the breakdown of the subject (elements) can be described as follows (each element is scheduled to take about an hour).

Lesson topic	Handling of bush cutter and proper working clothes
Attainment objective	1 Capable of understanding proper work clothes and use of protective gear 2 Capable of fitting a bush cutter properly 3 Capable of starting/stopping a bush cutter safely
Training item	1-1 Danger inherent in the workplace 1-2 Types of clothes and footgear and required characteristics 1-3 How to wear the clothes and footgear (button, sleeve, hem…) 1-4 How to wear protective gears (face cover, …) 1-5 How to check the safety of their clothes, footgear and protective gear 2 How to harness shoulder/waist band (harnessing method, selecting safe and comfortable length) 3-1 Starting the bush cutter (starting procedures, choke and accelerator adjustment) 3-2 Considerations for safe starting (people and objects in the vicinity, posture, rotating blade, gasoline in peripheral area) 3-3 How to stop the bush cutter (stopping the rotating blade and engine)

Planning training content is deciding attainment objectives and training items corresponding with differences in details. Training content can be described broadly as two levels of details. The first level corresponds to the training contents taught in a lesson. The second level represents aggregated contents of VT courses that consist of a number of lessons for several days, half a year, and one or two years. In the case of the forestry training course described above, the first level corresponds to the training contents of a lesson that takes one to three hours, and the second level represents the aggregated training contents that require one week or one month. Consideration of training items ultimately comes down to a detailed review of what items should be taught in the lessons.

The approach to determine training content is broadly divided into four methods.

The first method makes reference to VT standards and other relevant information. Sections 'cut and pasted' from the vocational standards and VT standards comprise the skeleton of the contents. See "3.4.3 Curriculum development based on VT standards" for specific procedures of this approach.

The second method is based on ability analysis. In this approach, you first list up ability and competence items required in the workplace which a graduate from VT course is expected to enter in an arbitrary manner disregarding system or order of the duties, activities and works. Then, the listed items are arranged and reorganized to form consistent training content. See "3.4.4 Curriculum development based on ability analysis" for specific procedures of this approach.

The third method is based on target analysis. In this approach, you first make up a systematic scheme of ability items that are required for a graduate from VT course in his/her workplace – from a broad outline down to detailed requirements. Then, these items are reorganized to form consistent training contents. See "3.4.5 Curriculum development based on target analysis" for specific procedures of this approach.

The fourth method is based on job breakdown analysis. In this approach, you first observe the duties, activities and works actually assigned to the workers in the workplace which a graduate from VT course is scheduled to enter, and arrange the observations into a list of procedures and important instructions. Then, these are reorganized to make up training contents. See "3.4.6 Curriculum development based on work observation" for specific procedures of this approach.

3.4.2 Attainment objectives and training items

(1) Attainment objective

When planning training content, the content is described using attainment objectives and training items. An attainment objective is described in terms of the competence a trainee should have acquired when he/she completes the training. The level of details required for the attainment objective may depend on how detailed the training plan is. Here, the method to describe an attainment objective is explained, systematically assuming the most detailed class plan is made.

An attainment objective should be described with the wording "(He/she is) capable of …ing such and such". It should be described by specifying the "objective" and "action", as illustrated in the table below. The "objective" is an element of the engineering system that defines the actions to be taken, and "action" is an aggregation of actual implementation procedures. Therefore, the attainment objective description will become more detailed as the refinement level of the objective description increases. As seen from the table below, training content becomes clearer as the objective is described in more detail.

Table 3-4 Example of "Objective" + "Action" Description:

Capable of performing shield metal arc welding
Objective　　Action

Table 3-5 Example of Detailed Objective Description:

Capable of performing flat position shield metal arc welding of intermediate mild steel plate Capable of selecting conditions required for optimum shield metal welding of intermediate mild steel plate

To verify the description of an attainment objective properly, it is adequate if a set of concrete actions are described.

In setting attainment objective related knowledge, a description such as "capable of understanding shield metal arc welding" does not necessarily lead to a concrete action. Thus, even though the "capable of …ing" format is used, it may be inadequate for defining an attainment objective because it does not link to a set of concrete specific actions.

In setting attainment objectives related to knowledge, there are often cases where such expressions as "capable of understanding…" or "know about..." are used. A simple, and often preferable, alternative for them is "capable of explaining…". As concerning the reason why the trainee should acquire the knowledge, you can envision many situations where the knowledge plays an essential role. Thus, a more practical alternative for describing the attainment objective would be "capable of using … for performing …". For example, a good guidance method would be one that utilizes the names of each part of equipment as key knowledge. The validity of this approach is easily understood if we think of this

example case: when a VT instructor tries to let the trainees do certain work by indicating the name of a part of equipment, the trainee would be at a loss if he/she does not recognize where it is located. In such cases, wordings such as “capable of locating the indicated part in …equipment” would be more practical than “capable of explaining the name of part in … equipment”.

Training objectives stipulated by the government or facilities and VT standards defined by the government often use such expressions as “capable of understanding …” and “know about …” to describe training objectives related to acquiring knowledge. In such cases, an examination of the underlying assumptions is highly desirable: i.e. to what degree of depth and applicability of the knowledge on the part of trainees is assumed. For example, the skill levels implicated by the objective descriptions in VT training documents in Japan are illustrated in “3.4.3 Curriculum development based on VT standards”. According to this, “know well about…” corresponds to “trainees are instructed to acquire not only correct understanding, but also knowledge applicable to work”. The criteria “know about…” does not require, on the other hand, practical applicability of the knowledge to tasks. Therefore, the manner of instructing trainees in knowledge should vary accordingly with the objectives. When trainees are instructed to acquire knowledge applicable to work, the VT instructor should explain theory first and after that let them work on exercises for which applicable knowledge is required. On the other hand, if applicable knowledge is not required, explanations in a class delivered by VT instructors would be enough.

When instructor sets up an attainment objective using “capable of understanding…” and “know about…”, he/she should clarify what extent of knowledge is required at the actual workplace beforehand.

(2) Training item

Training items represent the contents to be instructed for the trainee to achieve attainment objectives. When you examine training items using various methods, you will be able to find appropriate ones, if you are using the assumption of rough classification. The following sections explain rough classification of training items.

①Knowledge, skill and attitude

When a person performs a task, he/she naturally tries to find the optimum way to complete it by exploiting available knowledge – manuals, instruction sheets, oral instruction sand past experiences. In other words, he/she will not be able to complete the task without knowledge.

However, reading a manual may not aid in successful completion of the task if the person is quite new to the type of task at hand. The ability to translate documented knowledge (manuals, etc.) into practical operations is called “skill”.

In addition, the basic “attitude” he/she shows while tackling the task will have a large effect on the results. If we think of two car drivers – one that always keeps a safety-oriented attitude and the other that tends to ignore safety considerations for the sake of reaching the destination as fast as possible – it is apparent that the difference in “attitude” can have a great impact on the manner of driving.

Table 3-6 below illustrates classification of training items for car driving into the three categories – knowledge, skill, and attitude - in terms of a given attainment objective “capable of turning a corner”.

Table 3-6 Knowledge, Skill, and Sttitude Required to Turn a Corner

Knowledge	Rules to be obeyed when turning a corner (procedures to turn on the blinkers, pulling over to one side, and checking rear safety) Car movement when turning the steering wheel (the car starts to turn when the wheel is steered, turning radius difference)
Skill	Ability to predict correct timing to turn on the blinkers before starting to turn the car Ability to, while driving a car, pay attention to the immediate environment and rear of the car Ability to manipulate a series of operations (checking rear of the car → turning on the blinkers → pulling over to one side → turning the wheel)
Attitude	Driving safely Avoidance of scratching the car Driving manner to maintain fellow passengers’ comfort Avoidance of obstruction to other cars

When conducting training on car driving in terms of the attainment objective “capable of turning a corner”, the instructor should instruct the three items, i.e. knowledge, skill, and attitude.

②Safety, success/failure, and efficiency

The procedures and due considerations required to perform a task successfully can be classified, based on the aim, into three items: safety, success and failure, and efficiency. “Safety” is the item to complete the task safely. “Success and failure” is for completing the task with the required precision and quality. “Efficiency” is for speedy and smooth completion of the task.

Table 3-7 below illustrates classification of training items for car driving into the three categories - safety, success/failure, efficiency - in terms of a given attainment objective “capable of turning a corner”. In the previous section, the training item was viewed from three points – knowledge, skill, and attitude. The introduction of additional point of view “efficiency” accompanies a new training item “method to turn the wheel sharply”, which is added to the list.

The perspective gained by classifying training items can make it easy to identify the required training items.

Table 3-7 The Task “Turning a Corner” Broken Down to Three Factors: safety, success/failure, and efficiency

Safety	Rules to be obeyed when turning a corner (procedures to turn on the blinkers, pulling over to one side, and checking rear safety) Avoidance of scratching the car Driving safely
Success/failure	Car movement when turning the steering wheel (the car starts to turn when the wheel is steered, turning radius difference) Ability to predict correct timing to turn on the blinkers before starting to turn the car Ability to, while driving a car, pay attention to the immediate environment and rear of the car Ability to manipulate a series of operations (checking rear of the car → turning on the blinkers → pulling over to one side → turning the wheel) Avoidance of obstruction to other cars
Efficiency	Method to turn the wheel widely and comfortably ↑ a training item discovered through reviewing from the “efficiency” point of view

3.4.3 Curriculum development based on VT standards

A VT standard may already be stated in the law when you start to develop a VT course. As stated in “1.3.3(2) VT Standard”, training standards have been defined in Japan applicable to VT. Two tables from the section are reproduced below (Table 1-2 and Table 1-4).

Table 1-2 (reproduced from 1.3.3, with partial omissions)
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
Omitted				
Specialized practice	1	Machining practice	250	Machining work experiment, -omitted-, lathe, milling machine, NC machine o programming peration, 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-

Table 1-4 (reproduced from 1.3.3) 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 systems			
	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

As these VT standards generally stipulate the attainment objectives, training subjects and training hours, these provide useful references for target analysis (see "3.4.5 Curriculum development based on target analysis"). Carefully review each of the training items while attempting to develop the curriculum. That is, developing a curriculum based on the VT standard simply means to make up a set of items as shown in Table 1-7 that contains all of the training items prescribed in the VT standards.

Table 1-7 (reproduced from 1.4.3) 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 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, a set of tools and a set of measuring instruments			
Remarks				

In the meantime, the attainment objectives listed in Table 1-4 are described assuming three knowledge levels for subjects - i.e. "know well", "know" and "roughly know" – and, by the same token, three skill levels for practice – "well capable", "capable" and "roughly capable". Each indicates the levels of knowledge/skill as shown below.

Table 3-8 Level Description of Knowledge/Skills

Theory	Know well about	Basic and fundamental knowledge that a skilled worker must have perfect understanding of. Trainees are instructed to acquire not only correct understanding, but also knowledge applicable to work.
	Know about	Knowledge that a skilled worker should generally know. Trainees are instructed to acquire correct understanding.
	Roughly know about	Knowledge that a skilled worker is recommended to have general understanding of. Trainees are instructed to acquire a sound overview of the item.
Practice	Well capable of	Doing routine work that a skilled worker must have a good command of. Trainees are instructed to acquire the skills efficiently.
	Capable of	Doing routine works that a skilled worker is generally required to perform. Trainees are instructed to acquire proper procedures to complete the work.
	Roughly capable of	Doing work that a skilled worker is recommended to have a command to complete. Trainees are instructed to acquire the skills to perform the work without much difficulty.

Note that, depending on the VT standards, there may be cases where some of the training items and attainment objectives are undefined or have room to be set the curriculum freely or flexibly based on regional training needs. For such undefined elements, additional training items can be added using the approaches described in the following sections.

3.4.4 Curriculum development based on ability analysis

(1) Features of curriculum development based on ability analysis

The process of curriculum design starts with the analysis of training objectives set forth at the time of conceptual rendering of the VT course, followed by shaping them into concrete attainment objectives. Listing up of detailed learning contents should be performed in this stage. A feature associated with the curriculum development based on ability analysis is to use group discussions (brainstorming) for listing up the learning contents. Many experts who have a good working knowledge of training objectives (image of ideal skilled workers) participate in the group meetings.

DACUM (Developing A Curriculum), developed in Canada, is a typical method of the curriculum development based on ability analysis, which has been recognized as a useful application in ASEAN countries.

In Japan also, a curriculum development based on ability analysis was born: CUDBAS (Curriculum Development Based on Ability Structure). Since its inception, CUDBAS was introduced to many developing countries as a tool for curriculum development and utilized by them. CUDBAS has now extended its area of application, in addition to curriculum development, as a human resource development tool in enterprises and as a tool for VT instructors who connect VT institutions with enterprises.

In the following part of this section, an introduction to curriculum development based on job analysis is presented in reference to the descriptions of CUDBAS in the following documents: “PROTS (PROgressive Training System for Instructor) Manual” (B2 Drawing up a Training Programme) published by the Overseas Vocational Training Association (copyright: JEED) and the Training Method Handbook (B2 Drawing up a Training Programme).

(2) Overview of curriculum development based on job analysis

In general, curriculum development consists of scope and sequence. The scope signifies the range and extent of the training contents, and the sequence specifies the ordered arrangement of instruction.

The curriculum development based on job analysis is carried out following the seven steps described below, where 1) to 5) represents the scope, and 6) and 7) correspond to sequence. In the sequence portion, the development work is performed in cooperation among persons with higher understanding about the attainment objectives (image of ideal skilled workers) of the actual VT course with the “facilitators” capable of practicing job analysis.

The sequence should be developed with VT instructors who have experience in curriculum design. This includes, for example, tips for effective training from the viewpoint of the trainees, e.g. “from simple to difficult instructions” and “theory in the morning session and practice in the afternoon session”.

In the following part of this section, curriculum development based on job analysis (the seven steps: 1) to 7)) is

presented in reference to a “Training course for cash register workers in supermarkets” as a case example.

<Note> In section 3.4.4, we use “can” in substitution for “capable of …ing” in “Figure.3.1, 3.2, 3.3, Table 3-11, 3-12, and 3-13”.

Table 3-9 Seven Steps in Curriculum Development Based on Job Analysis

Scope	Sequence
1) Make a list of abilities of training objectives (image of ideal skilled workers) 2) Review cross-relationships between the listed items 3) Determine the training level 4) Make a structured chart of abilities and qualifications 5) Define the subjects and organize the attainment objectives	6) Make a training hours allocation table 7) Make a training duration schedule

(3) Flow of curriculum development based on job analysis

①Preparation:

A quiet private room, a wide table and chairs that accommodate 5 to 6 persons comfortably, 200 ABL (Ability) cards, 30 Duty cards, 5 sheets of vellum paper, glue or cellophane tape, a whiteboard and documents on training needs and course setting result.

②Work group organization:

- The number of brainstorming participants is preferably around five. These participants should have good knowledge concerning the attainment objectives (image of ideal skilled workers) for the curriculum to be developed, and be called from various job types. If the attainment objective is a cash register worker, they would include an experienced cash register worker, his/her boss, purchasing agent and shop manager, etc.
- For concentrated and effective discussion, a quiet private room away from the hustle and bustle of the workplace should be used.
- All the members are on equal footing in terms of the qualifications and authorization to develop the curriculum. Personal criticism and attacks must be strictly avoided. An atmosphere of mutual respect is created through listening actively to each other, leading to the formation of productive teamwork.
- For curriculum development of a short-term course, the discussion normally takes about 5 hours for reviewing the scope, and an additional 5 hours for the sequence.

③Procedures of discussion:

- Based on the reference material shown below (“Training needs and course settings”), all of the members build up a common understanding on the purpose of the discussion and final attainment objectives.
- Each of the members introduces him/herself to others and explains his/her concern and view on the occupation for which he/she is going to develop curriculum.
- The VT instructor who presides over the discussion gives a brief description on the procedures for a curriculum development.
  (key points for proceeding discussion, printouts are handed out to the members)

Table 3-10 Training Needs and Course Settings (reference for discussion)

Training needs
a) Training for cashiers in supermarkets has been conducted on an OJT basis, but its limitations have become apparent. Problems inherent in this approach include the different level of attainment in skill and knowledge (almost unavoidable because the instructors engage in daily jobs aside from the training job). A systematic off-the-job training approach is strongly needed.
b) Workers who can properly carry out daily jobs are needed.
c) Workers who can perform additional peripheral jobs – as well as the cashier job – are highly desirable from the standpoint of work place improvement.

Course settings:
Name: Cashier training course
Training duration: 4 days (determined by the client for the training)
Eligible person: 120 regular employees for over-the-counter and cashier jobs (junior high school graduates or equivalents)
Quota: 20 persons/course (determined through training environment, instruction personnel and efficiency considerations). This course will be held 6 times.

④Discussion and group work:

● Filling out ABL (Ability) cards

- Each member fills out "abilities required to perform cash register and peripheral operations" in 30 ABL cards within 30 minutes.
- Be aware of the following three abilities while filling out the card. It is important to make it clear that the training items (attainment objectives) include "skill", "knowledge" and "good attitude toward the task" while designing curriculum. The members are instructed to write them in specific wordings: "can … (capable of ...ing)" for the skill, "know about …" for the knowledge, and "be in (have an) attitude…" for the attitude.
- Instruct members to write one ability item on one card.

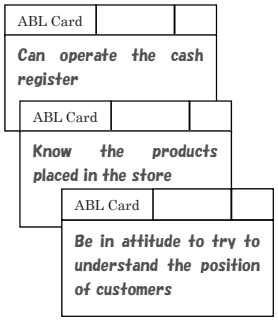


Figure 3-1 ABL Cards

● Classifying the cards

First, one of the members reads out one of his/her cards and places it on the desk. The other four members check theirs against the one on the desk. If a card with the same expression is found, it is placed upon the one already on the desk. A card with a similar expression, but not the same meaning, is placed next to the card. The first member also checks the others against the one on the desk and in turn places those similar in expression next to the card. Note that the similarity in this context refers to the relationship connecting the work and ability, and not to wordings such as "can … (capable of ...ing)" and "know about …", etc. For example, those related to "Cashier work" and those related to "Improvement of workplace" are separately arranged (these two themes are included in the list of training objectives).

While grouping the cards, a member may add a new card if he/she hits on a new idea or recalls a lapse of memory, and is recommended to rewrite one or more of them for better clarity.

● Arranging the cards

In this process, the stacks of cards are classified into types of jobs and arranged in row by type. When the stack of cards arranged in a row become 4 or 5, a Duty card is placed on the left end of the group. A key word that represents the job type – for example "In charge of cashier operation", is written on the Duty card for efficient classification and arrangement of the ABL cards.

Checking the ABL cards arranged in row by types of jobs to see if they are lacking any important elements. Each array should also be examined from the viewpoints "Knowledge alone is not enough to move one's work forward" and "All skills and no knowledge is not enough to move one's work forward". Each task should be carefully reviewed to ensure that it is composed of multiple skills, knowledge and the proper attitude.

The ABL cards, placed based on types/nature of the work, are rearranged, from left to right, in the order of importance from the viewpoint of moving forward with the work. The most important ABL card is placed next to the Duty card, and others follow in the order of decreasing importance.

● Write ranking levels of importance (attainment levels of the training)

Each ABL card is assigned with one of the levels of importance (listed below) to signify how critical it is in performing the task.

A: Critical importance, detailed knowledge or excellence in competence required

B: Importance of an average level, general knowledge and standard competence is enough

C: Although of less importance, overall knowledge or experience is recommended.

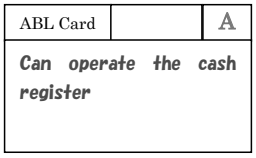


Figure 3-2 ABL Card (importance level)

After importance ranking, one of the designation symbols (A, B, or C) is written in the upper-right space of the card.

● Drawing up a required abilities and qualifications chart

Up to this step, the works have been arranged from left to right, from the ability with highest importance to those of lesser importance. Next, the horizontal arrays are shifted up and down according to the importance of the work unit – the array that describes the work of primary importance comes to the top. This shifting operation is not performed on a desk, but rather by pasting them on vellum paper. When finished, a card number is written in the upper center space of each card.

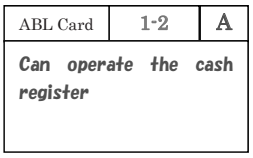


Figure 3-3 ABL Card (card number)

The first ABL card of the array of highest importance, i.e. the card placed next to Duty card 1 on the top left, is assigned with the card number "1-1", and sequential numbers are assigned to the cards arranged next to it.

The list completed all rearrangements of cards and which represents required abilities and qualifications is called a job analysis chart. Namely, this is a visible matrix representing the relation between works and abilities.

Table 3-11 is a job analysis chart of the analysis of cashier works in a supermarket through the above mentioned method, and is transcribed into spreadsheet software. Utilizing spreadsheet software for storing the job analysis chart enables PC-based operations in subsequent development stages and drastically streamlines data and information sharing among the members.

Table 3-11 Job Analysis Chart

Job analysis Chart_ *Professionals Target* "Cashier of the supermarket"

Date:	Name of group members									
Degree of importance : A・B・C:	A: Very important. The worker should know the details of it or able to do it very well. B: Moderate. The worker should know it generally or able to do it moderately. C: Not so important. The worker should know the outline of it or have some experience.									
Duty	ABILITY-1	ABILITY-2	ABILITY-3	ABILITY-4	ABILITY-5	ABILITY-6	ABILITY-7	ABILITY-8	ABILITY-9	ABILITY-10
1	1－1 A	1－2 A	1－3 A	1－4 A	1－5 A	1－6 A	1－7 A	1－8 A	1－9 A	1－10 A
Receive payment from the customer	Can greet customers	Can operate the cash register	Can receive money and give change	Can handle the payment by credit card	Can put goods into a basket	Can manage goods that are damaged or have no price tag	Can take care of the money in the cash registers	Can supply change	Can manage goods around the cash register	Can aggregate sales
	1－11 A	1－12 A	1－13	1－14	1－15	1－16	1－17	1－18	1－19	1－20
	Can replace the cash register roll	Know the structure of cash register								
Duty	ABILITY-1	ABILITY-2	ABILITY-3	ABILITY-4	ABILITY-5	ABILITY-6	ABILITY-7	ABILITY-8	ABILITY-9	ABILITY-10
2	2-1 A	2-2 A	2-3 A	2-4 A	2-5 A	2-6 A	2-7 B	2-8 B	2-9	2-10
To service customer	Can interact with customers politely	Can respond with a smile	Can respond with being neatly dressed	Have an attitude that allows calm response to unforeseen circumstances	Know the products placed in the store	Have an attitude to try to understand the position of customers	Can respond equitably to any customer	Can do product packaging		
Duty	ABILITY-1	ABILITY-2	ABILITY-3	ABILITY-4	ABILITY-5	ABILITY-6	ABILITY-7	ABILITY-8	ABILITY-9	ABILITY-10
3	3－1 A	3－2 A	3－3 A	3－4 A	3－5 A	3－6 A	3－7 A	3－8 B	3－9 B	3－10 B
To improve the work	Know the policy and philosophy of their company	Know about the work and role of c ashier	Know the main points of handling and storage of the products	Have an attitude that tries to improve the workplace environment and work	Have an attitude of "let's have good relationships"	Know how to manage hygiene	Be in attitude of responsibility	Know the importance of awareness of cost	Know the allocation of duties in the store	Know about the system of supermarkets and retail trade
	3－11 C	3－12	3－13	3－14	3－15	3－16	3－17	3－18	3－18	3－20
	Know the relationship with the store, suppliers and affiliated companies and headquarters									

● Making a structured chart of abilities and qualifications

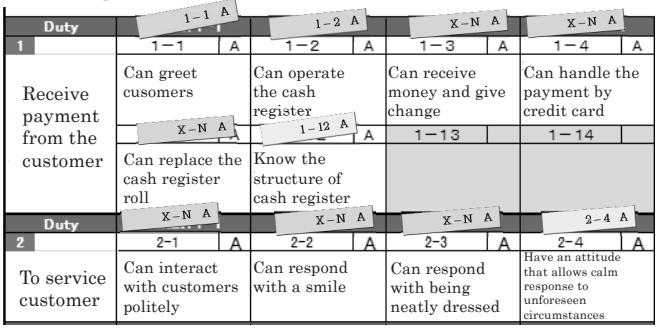
After the completion of a job analysis chart, a structured chart of abilities and qualifications is made based on it.

This structured chart is used to review, with a focus on each ABL card in the job analysis chart, the relations between the items' relational closeness and the validity of the work sequence as a training course.

In concrete terms, items that seem to be accommodated in a single training will be picked up from across the chart, and grouped together.

The grouping procedure makes use of Post-it sheets (3 colors, 1cm×4cm) and proceeds as follows. If you find a card with a "Can …(capable of ...ing)" description on it, fill in the card number and level of importance on a blue Post-it and stick it onto the upper part of the card. Similarly, the same information for a card with a "Know about..." description is written on a pink Post-it (1-12A), and for a card with a "Be in (have an) attitude…" a yellow Post-it (2-4A). They are also stuck on the upper part of the card. The members, with reference to a printout of the job analysis chart, transfer the Post-it sheets to a space between the rulers on a second sheet of vellum paper.

Table 3-12 Drawing Up a Structured Chart of Abilities and Qualifications



1 Receive payment from the customer	1−2 A 1−4 A 1−11 A 1−12 A	1−7 A 1−8 A 1−10 A	1−3 A 1−5 A 1−6 A 1−9 A	1−1 A				
2 To service customer			2−5 A	2−1 A 2−2 A 2−3 A 2−4 A	2−6 A 2−8 B			2−7 B
3 To improve the work					3−3 A 3−6 A	3−1 A 3−9 B 3−10 B 3−11 C	3−2 A 3−5 A 3−7 A	3−4 A 3−8 B

Structure chart of required abilities and qualifications

Name of Subject / Duty	1 Method of operating cash register	2 Sales management practice	3 Practice on cash register duties	4 Practice on customer service	5 Nature and handling of goods	6 Supermarket outline	7 Duties of cashier	8 How to proceed with business improvement
1 Receive payment from the customer	1−2 A 1−4 A 1−11 A 1−12 A	1−7 A 1−8 A 1−10 A	1−3 A 1−5 A 1−6 A 1−9 A	1−1 A				
2 To service customer			2−5 A	2−1 A 2−2 A 2−3 A 2−4 A	2−6 A 2−8 B			2−7 B
3 To improve the work					3−3 A 3−6 A	3−1 A 3−9 B 3−10 B 3−11 C	3−2 A 3−5 A 3−7 A	3−4 A 3−8 B

● Reorganization of attainment objectives by subject

Attainment objectives can be coordinated by describing them based on Table 3-12 completed during the subject design. Table 3-13 is the list of attainment objectives sorted on a subject basis. In this table, the attainment objective fields are filled in with the contents from the ABL cards described above. The training hour fields contain the projected number of hours required for attaining the subject's attainment objective. Let us tentatively call them "draft training hours". As it is a

normal practice for a client to specify the total training duration, training hours for each subject may need mutual adjustment during the course setting process. Major training methods are described below (unit of time for training: one hour).

Table 3-13 Attainment Objectives List

						Skill	Knowledge	Attitude
Name of training subject	1 Method of operating cash register	2 Sales management practice	3 Practice on cash register duties	4 Practice on customer service	5 Nature and handling of goods	6 Supermarket outline	7 Duties of cashier	8 How to proceed with business improvement
Main method	Lecture Practice	Practice	Practice	Practice	Practice	Practice	Practice	Lecture Practice
Draft training hour	(4hours)	(2hours)	(3hours)	(3hours)	(2hours)	(3hours)	(3hours)	(3hours)
Attainment objectives	1-2 A Can operate the cash register	1-7 A Can take care of the money in the cash registers	1-3 A Can receive money and give change	1-1 A Can greet customers	2-6 A Have an attitude to try to understand the position of customers	3-1 A Know the policy and philosophy of their company	3-2 A Know about the work and role of cashier	2-7 B Can respond equitably to any customer
	1-4 A Can handle the payment by credit card	1-8 A Can supply change	1-5 A Can put goods into a basket	2-1 A Can interact with customers politely	2-8 B Can do product packaging	3-9 B Know the allocation of duties in the store	3-5 A Have an attitude of "let's have good relationships"	3-4 A Have an attitude that tries to improve the workplace environment and work
	1-11 A Can replace the cash register roll	1-10 A Can aggregate sales	1-6 A Can manage goods that are damaged or have no price tag	2-2 A Can respond with smile	3-3 A Know the main points of handling and storage of the products	3-10 B Know about the system of supermarkets and retail trade	3-7 A Be in attitude of responsibility	3-8 B Know the importance of awareness of cost
	1-12 A Know the structure of cash register		1-9 A Can manage goods around the cash register	2-3 A Can respond with being neatly dressed	3-6 A Know how to manage hygiene	3-11 C Know the relationship with the store, suppliers and affiliated companies and headquarters		
			2-5 A Know the products placed in the store	2-4 A Have an attitude that allows calm response to unforeseen circumstances				

● Drawing up a training hours allocation table

The following paragraphs explain how to draw up a training hours allocation table (Table 3-14) based on the attainment objectives list (Table 3-13), and with consideration paid to such items as “who”, “when”, “how long (hours)” and “sequence” for better instruction.

The total course length is defined in the training course setting: i.e. four days. The projected training hours assumed when the attainment objectives list was drawn up add up to 23 hours. Four-day training (7 hours/day) provides a framework of 28 hours, leaving 5 hours of redundancy.

The utmost importance in the process of the hours allocation is the order in which instructions take place. Basically, trainees without any readiness should start with simple and easy instructions followed by ones with higher difficulty in

incremental steps. However, there are certain instructions, even if they may be difficult, that should be given at an early stage of the course of the subject. A thorough discussion is desirable, even though this process may not pose a serious difficulty, because the members are likely to accumulate ample experience in curriculum building.

As a matter of course, the VT course planning should include time considerations for such items as the enrollment ceremony, orientation and achievement evaluation. If the VT instructors have a say in the time scheduling, adjustment should be made - drafted hours vs. actual necessary/required instruction hour - in this stage. The adjustment, if needed, is carried out through the importance review of attainment objectives, especially through devising more efficient training methods. For example, some of the practice training needs only illustrative demonstration by the VT instructor, and omission of trainee practice may not undermine the training quality. Proactive use of good training materials (videos, etc.) may help the VT instructor to make the lesson plan more efficient.

Table 3-14 Training Hours Allocation Table

Name of Training Subject	Instructor (Person in charge)	Implementation hour and training schedule					
		1st day	2nd day	3rd day	4th day	Planned hours	(Draft training hours)
Opening ceremony, closing ceremony and evaluation	All	1.5		1	2	4.5	0
Method of operating cash register	Mr. SHIMIZU	4				4	(4hours)
Sales management practice	Mr. OHTA			2		2	(2hours)
Practice on cash register duties	Mr. OHTA		2	1		3	(3hours)
Practice on customer service	Ms. NAMAMURA	1.5	1.5			3	(3hours)
Nature and handling of goods	Mr. YOKOMIZO		2			2	(2hours)
Supermarket outline	Mr. SUZUKI		1.5		2	3.5	(3hours)
Duties of cashier	Ms. YOSHIDA			3		3	(3hours)
How to proceed with business improvement	Mr. KIKUCHI				3	3	(3hours)
Training hours of the day⇒		7	7	7	7	28	(23hours)

● Drawing up a training duration schedule

Once the training hours allocation table is completed, the next step is to draw up a detailed, hour-by-hour timetable. An important tip for this process is to assign theoretical subjects to morning hours, when the brain is fresh, and incorporate many practices in the afternoon, when drowsiness may occur. An additional advantage of assigning practices in the afternoon is to allow enough time for sorting out and cleaning.

Table 3-15 Training Duration Schedule

Time / Date	09:00–10:00	10:00–11:00	11:00–12:00	12:00–13:00	13:00–14:00	14:00– 15:00	15:00–16:00	16:00–17:00
Monday, September 18	Atten–dance	Opening ceremony & Orientation	Practice on customer service (Ms. NAKAMURA)	**Lunchtime**	Method of operating cash register (Mr. SHIMIZU)			
Tuesday, September 19	Supermarket outline (Mr. SUZUKI)		Practice on customer service (Ms. NAKAMURA)	**Lunchtime**	Nature and handling of goods (Mr. YOKOMIZO)		Practice on cash register duties (Mr. OHTA)	
Wednesday, September 20	Duties of cashier (Ms. YOSHIDA)			**Lunchtime**	Practice on cash register duties (Mr. OHTA)	Evaluation Meeting	Sales management practice (Mr. OHTA)	
Thursday, September 21	How to proceed with business improvement (Mr. KIKUCHI)			**Lunchtime**	Supermarket outline (Mr. SUZUKI)		Evaluation	Closing ceremony

3.4.5 Curriculum development based on target analysis

Target analysis is a method to analyze logically the abilities required (hereinafter referred as "readiness") for achieving attainment objectives, and to define the contents to be learned and the order of learning them.

A schematic representation of the target analysis is shown in Figure 3-4. Whereas curriculum development based on ability analysis is a bottom-up approach against a background of practical field experiences, the target analysis is a top-down (break-down) process starting from the attainment objective to lower levels in the hierarchy. The breakdown terminates at the point where the process reaches an already learned item (a requirement for attending the training). This analysis method can be viewed as one of the rational approaches because a VT should aim at acquiring abilities defined by the attainment objective.

Illustrative results that would be obtained through target analysis are shown in Figure 3-5 and Table 3-16, where a curriculum development project for children to acquire safety skills to ride a bicycle in traffic (open roads) is used as an example. Figure 3-5 clearly lays out the readiness and learning order for achieving the attainment objectives. Table 3-16 defines the learning contents and how to share the training hours.

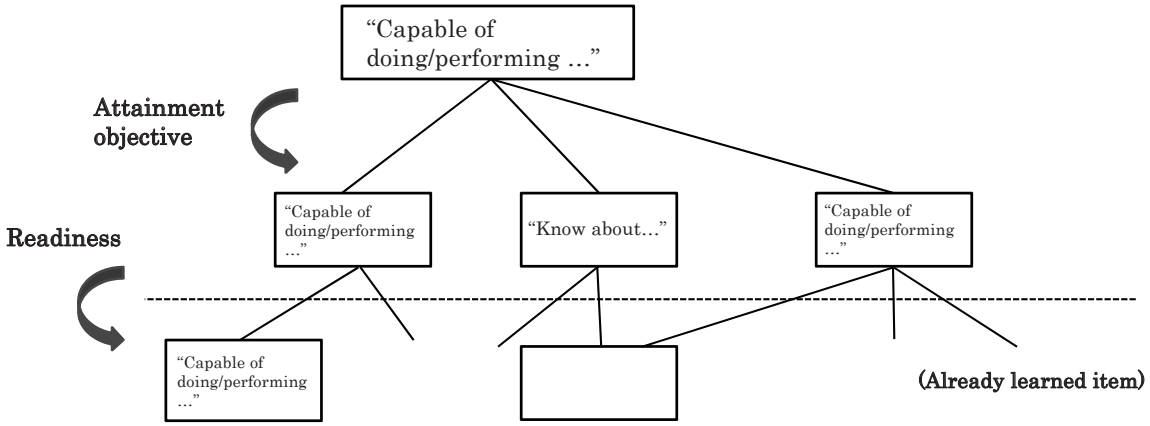


Figure 3-4 Schematic Representation of Target Analysis Chart

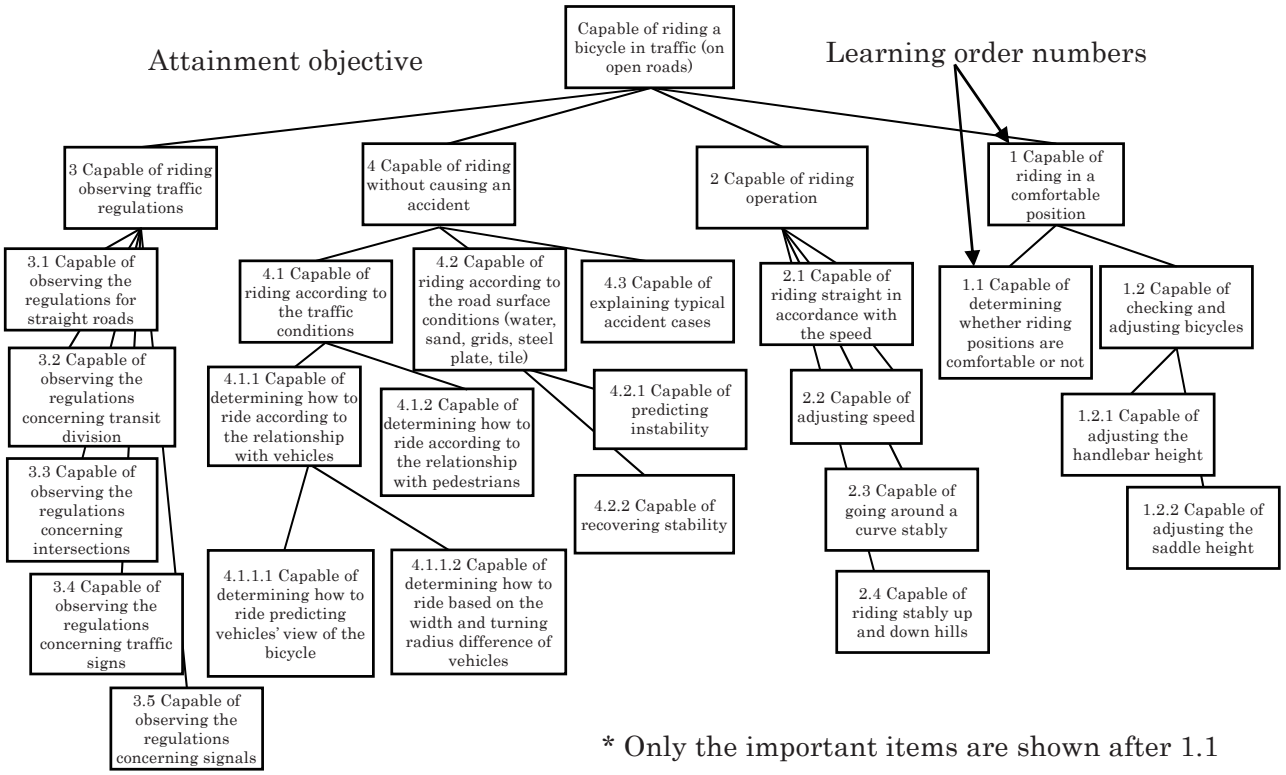


Figure 3-5 Target Analysis Chart and Description of Learning Order Numbers

Table 3-16 Example of Drawing Up a Lesson Item Organization Sheet

Subject name	Safe bicycle riding for children	
Attainment objectives	1 Capable of riding in a safe and comfortable position 2 Capable of riding operation 3 Capable of riding observing traffic regulations 4 Capable of riding without causing an accident	
Detail	Content	Hours
1. Riding posture	1.1 Correct riding posture 1.2 Inspection and adjustments of a bicycle 1.2.1 Handlebar height 1.2.2 Saddle height ・ ・	○○
2. Riding operations	2.1 Riding straight in accordance with the speed 2.2 Adjusting speed control 2.3 Turning a curve ・ ・	○○
3. Riding in accordance with traffic rules	3.1 ・	○○
4. Riding without accidents	4.1 Riding according to the traffic situation 4.2 Riding according to the road surface conditions 4.3 Traffic accidents cases ・ ・	○○
5. Verification test	5.1 Theoretical test 5.2 Practice test	○○

Insufficient covering of curriculum contents to secure safe bicycle driving may increase the possibility for children to be involved in accidents. Any parents who can ride a bicycle would be able to instruct, in one sense, some of the items

shown in Figure 3-5 based on their own experiences; for example, “2. Capable of riding operation” and “3. Capable of riding observing traffic regulations”. However, only a few parents can instruct consciously on Item “1. Capable of riding in a comfortable position”. Furthermore, even fewer parents would imagine themselves teaching issue “4. Capable of riding without causing an accident”. Translating these situations into VT indicates that insufficient coverage of certain aspects of required training or insufficient instructions would result in disasters in the workplace or defective production.

A good VT instructor would try to improve the training on a daily basis by having an internal conversation with him/herself concerning whether there was any insufficient coverage of teaching. One feature of target analysis is its emphasis on logical coherence, as well as visual representation, which should prove effective in such situations.

Major steps in target analysis, as applied to curriculum development, are shown in Table 3-17, a step by step description of target analysis flow.

Table 3-17 Steps of Target Analysis

Steps	Description	Results
Step 1	Starting from the attainment objective, a breakdown process takes place to identify a set of readiness.	Target analysis chart
Step 2	Fill the learning order numbers into the target analysis chart.	Learning order numbers
Step 3	Thematic description of each unit of the lesson based on the learning order numbers.	Lesson item organization sheet

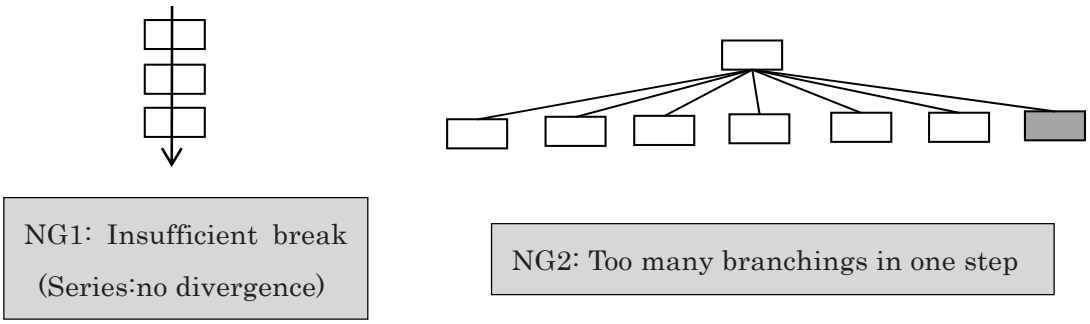


Figure 3-6 Inadequate Break Down Example of Attainment Objective

(1) Step 1: Drawing up a target analysis chart

Any convenient tool – a word processor, presentation software, or even handwriting - can be used to draw up a target analysis chart.

①Description of attainment objective

Normally, attainment objectives are described on a training subject basis. It should be a detailed description of the abilities each trainee should acquire by the end of the course. If training content of one lesson is to be analyzed, the attainment objective to be acquired within the training hours is written.

The readiness required for learner (trainee) to achieve the attainment objectives are written in the lower level of the hierarchical chart. The attainment objective can be classified into three categories: skill (Capable of…ing), knowledge (Know about…) and attitude (Be in attitude…). It is important that the words used in the description of the attainment objective be covered in the description of the readiness (i.e. items directly below in the hierarchy).

*Note 1: A readiness in the lower level should be broken into more than two subordinate concepts. A one-to-one relation (see NG1 of Figure 3-6) indicates that the breakdown simply represents paraphrasing.

*Note 2: If breaking down a readiness into two or more subordinate concepts is difficult or almost impossible, it may be an indication that the analysis object is more suited to the job breakdown method (see 3.4.6 Curriculum development based on work observation) rather than to target analysis.

*Note 3: In case the attainment objective (top level) is broken down into too many readiness items (see NG2 in Figure 3-6), it is likely that the lower level description is too complex and detailed. Detailed description should be left to the lower levels. Take microscope observation as an example. The magnification factor in the first layer (directly below the attainment objective) should be low (say, x5) and increase stepwise in the lower layers (x100 in the second layer, x400 in the third layer, and so on).

②Validity check on readiness

Keep asking yourself until you are completely sure that acquirement of the lower layer readiness satisfactorily qualifies the trainee to step forward to an upper layer readiness.

*Note 4: The validity check above is especially significant in the evaluation of the top level (attainment objective) and those in the layer immediately below it.

For example, inadvertent omission of "4. Capable of riding without causing an accident" (Figure 3-5) can result in a serious problem.

③Proceeding to lower layers

Ensure confidence in the validity and consistency of the relation between the respective readiness in two adjacent layers, then proceed to analysis of lower layers.

④End of analysis

The sequential analysis steps end when a previously learned item (i.e. a requirement for attending the training course) appears.

(2) Step 2: Setting learning order numbers

In view of the target analysis chart created in the previous steps, determine the optimum order to learn the items. Fill in a number for each of the items that designate learning order. As shown in Figure 3-5, the numbers start at the layer immediately below the attainment objective.

(3) Step 3: Making an lesson item organization sheet

Based on the learning order numbers determined in Step 2, fill in the learning contents organization in the lesson item organization sheet. An example of this sheet is shown in Table 3-16.

3.4.6 Curriculum development based on work observation

Curriculum development approaches based on work observation mainly make use of the job breakdown method.

In recent years, typical implementations of the job breakdown method are making full use of video cameras and PCs. The major advantage of using video cameras is repeatability: video footage stored on a PC can be viewed over and over again as needed. That is, this technique provides repeated job observation at will.

In addition, various functions of video reproduction extend the scope of job observation. For example, the job performer can observe his/her actual stepwise manipulations (freeze-frame) for interview (tips, knacks, etc.), enabling further refinement of the job breakdown.

In the following part of this section, a flow of video-based curriculum development is presented, where "Mowing underbrush" is used as a subject – one of the themes of one-week training contents in "3.4.1 Setting the training plan (curriculum) for the trainees to achieve their attainment objectives".

(1) Make video footage of "Mowing underbrush" performed by a skilled worker.

(2) Store it on a PC.

(3) Interview the skilled worker while viewing a series of stepwise freeze-frame images of his/her own actions with following questions.

- Names of the specific clothes and protective gears. Reason(s) to use them, and how to judge if it was appropriate to select them.
- How to start the bush cutter. The most important points in this procedure, and why they are important (in terms of safety and efficiency).
- Posture for holding the bush cutter. The most important points in this procedure, and why they are important (in terms of safety and efficiency).
- Targeted height for cutting and blade positioning (height from the ground and angle settings), and why he/she considers them optimal.

The interview is repeated in each step of the work.

For a good interview, it is important to pose questions in a relaxed way after freezing the footage.

It is also recommended to film the interview as well. This enables the interviewer to concentrate in the question and answer sessions without being distracted by other necessities such as taking notes.

The contents of the interview include such subjects as “Posture variations during the work”, “Worker’s perspective during the work”, “Hand and finger movements for handling tools” and “Consciousness during the work”.

(4) Review the interview footage and fill in the job breakdown sheet.

Table 3-18 Job Breakdown Sheet
Job name: Mowing underbrush

Operation step	Operation procedure	Summary
Wear protective gear	Checks on work clothes	Check buttons of collar and sleeves (prevention of grass entering inside) Put hem inside the trousers, check trouser belt (Loose belt causes gradual dragging of cloth, lowering work efficiency).
	Checks on work boots	Check if there are any holes, trace of cracks (Rupture during work can cause injury. Lowering of work efficiency) Put hem of trousers inside the boots to prevent floppy movements Lace up boot strings to prevent grass from entering
	Wearing a face guard	Cover down to the chin (prevent being hit by flying pebbles)
	Wearing gloves	Check if there are any pinholes Gloves should be put on last (It is difficult to conduct work with gloves)
Start engine	Check on fuel	Make sure the fuel tank is filled (It doesn’t start if empty)
	Check on the power switch (ON)	Turn on the switch (It doesn’t start if it is in OFF position)
	Fuel pump movement	Press the button several times (5 times or so) Until bubbles disappear (It doesn’t start if the carburetor is empty of fuel)
	Choke operation	Close the choke if the engine is cooled down Open the choke if engine is warmed up Check the choke if the engine doesn’t start by pressing starter
	Accelerator all closed	Too much gasoline flows if it is opened (If the plug is wetted by gasoline, no spark; engine won’t start) .....
	Starter operation	....
	Accelerator operation	....

(5) For each step listed in the job breakdown sheet, estimate the time required to instruct the item. Plan the instruction content to meet the time available for the training.

Example: In case of one hour training course, the first 2 steps in the breakdown sheet above (from wearing protective gear to engine start) will be estimated within the one hour interval, the instructor then schedules the lesson as follows.

Table 3-19 Organization of a One-Hour Lesson

Lesson topic	Wearing protective gear and starting engine
Attainment objectives	1. Capable of selecting and wearing clothes and protective gear for mowing underbrush 2. Capable of starting/stopping of the bush cutter safely
Training items	1-1 Dangers inherent in the workplace 1-2 Types of clothes and footgear, and required characteristics 1-3 How to wear the clothes and footgear (button, sleeve, hem,…) 1-4 How to wear protective gear (face cover, …) 1-5 How to check the safety of their clothes, footgear, and protective gear 2-1 Starting the bush cutter (starting procedures, choke and accelerator adjustment) 2-2 .....
Training hour	60 minutes

(6) Development of lesson plan and training materials

As described above, the training contents are determined from the knowledge gained through fieldwork observations. Then, analysis is made on these training contents to develop a lesson plan and training materials.

3.5 Development of Training Evaluation

3.5.1 Training evaluation

Training evaluation mentioned here refers to checking of whether trainees have learned the content taught in the lessons. For this, many people may have a general image of written examinations at important points of the lesson. However, training evaluation is focused on skill acquisition level expressed as "capable of…" in attainment objectives. For example, the observation of trainee's performance or the confirmation of trainee's understanding level are also evaluation.

Because training evaluation covers the aspects related to attainment objectives and training items, it is necessary to examine them in more detail. When developing a class plan, evaluation criteria are the focus points of what to teach. Therefore by considering what to teach to help trainees pass the test, the VT instructor can make it easier to design a class plan to reach the attainment objectives.

The following is the developing method of training evaluation excluding training assignments. Training assignments will be described in "3.6 Development of Training Assignments/Materials".

3.5.2 Flow and types of training evaluation

Major steps of training evaluation are implemented in the procedure of "measuring", "comparing with the standard", "deciding the value" and then "improving" as shown below:

Step 1 Measuring → measure the state of the trainees
Step 2 Comparing with the standard → look at the difference between the measurement result and the standard
Step 3 Deciding the value → make judgment of success or failure
Step 4 Improving → Analyze the measurement result and assist trainees so that they can succeed
Improve the lesson to increase the pass ratio

It is not only trainees who failed the exam that are to be "improved". If the pass ratio is low, there must be some problems in the lesson. What is to be improved here is the class plan. Even if all trainees succeeded, improvement may be necessary to shorten the training hours to pass the exam.

Here, focus on to the third and fourth steps. "Deciding the value" and "Improving" are different evaluation purposes. The purpose of deciding the value is to verify the trainees' ability for their benefit, more specifically, to show their prospective employers or current workplace that they have reached the attainment objective so that they can use the ability for their job. On the other hand, the purpose of "Improving" is to obtain necessary information for VT instructors to improve their lesson procedure, more specifically, to identify what to improve in order to shorten the path to success for trainees.

3.5.3 Four performance attributes of training evaluation

When developing training evaluation method, it is necessary to examine the following four performance attributes:

- Adequacy: ensure correct evaluation of what should be evaluated
- Objectivity: evaluation by anyone produce the same results
- Reliability: method always produce the same results
- Economic efficiency: the cost of the evaluation method within a feasible range

(1) Adequacy

Adequacy is the measure of whether the evaluation method to be developed can check the attainment of the attainment objectives/training items correctly. For example, adequacy may be very low if working hours are measured for an attainment objective concerning the accuracy of finishing. If you decide the evaluation method easily, it is likely to have low adequacy. It is a measure that should be carefully examined.

It is advised to look at the evaluation scope and method when examining adequacy. The evaluation scope is the scope of measurement of the trainees' condition. It is important to narrow down the scope to the matters necessary to check the achievement of attainment objective/training items[1]. The evaluation method refers to the method to measure the condition of the trainees. As shown in the example above, it is wrong to measure working speed when accuracy is to be checked. Here,

1 It is not specified here but one evaluation method may be developed for multiple training objectives/items. Such cases need special attention because the evaluation scope covers multiple training objectives/items.

what is to be checked is accuracy.

(2) Objectivity

Objectivity is the measure of whether different evaluators (VT instructors) can reach the same result. For example, evaluation through multiple-choice questions is objective because the same result is obtained regardless of who marks the answers. On the other hand, rating of carefulness in a practical skills test has low objectivity because the result is likely to differ depending on the marker.

Objectivity greatly depends on the evaluation method. Therefore, examine the evaluation method with a focus on how to enhance objectivity. When rating carefulness of working, you can enhance objectivity by defining the rating standard using a checklist of evaluation items.

(3) Reliability

Reliability is a measure to see whether the evaluation results of trainees who are at the same ability level, are always the same.

Suppose there are two trainees who have the same ability. Measured with a highly reliable evaluation method, they are expected to have the same result. In actuality, the results may differ slightly due to the influence of the environment/conditions. However, the difference must be very small. If the difference is large, evaluation is more influenced by the environment/conditions than by the trainees' ability and their ability is not evaluated correctly.

For this reason, it is necessary to devise ways to avoid the influence of the environment/conditions when developing an evaluation method.

(4) Economic efficiency

Economic efficiency is the measure to see the level of the cost of materials used for the evaluation method, labor hours for preparation, personnel and time for evaluation, etc. Low cost makes implementation easy, but generally, superior evaluation methods involve higher cost.

If the cost is at the level that enables prompt implementation, there is no need to change the evaluation method. If the cost is too high to implement, there is a need to change the method. The decision is difficult when the method is feasible but the cost is considerably high. In such a case, a decision should be made considering the balance with other functions.

(5) Balance of the four functions

It is difficult to develop an evaluation method that satisfies all of the four functions. Particularly in VT where mostly skills are measured, adequacy and objectivity/reliability are in a trade-off relationship.

For example, when evaluating the attainment of an attainment objective, "capable of…" concerning a certain skill, a multiple choice test on the work sequence may have very high objectivity but extremely low adequacy. On the other hand, when implementing a practical skills test to improve adequacy, objectivity could become low depending on the evaluation method.

The closer the practical skills test is to the actual environment/conditions, the more adequate the test becomes. However, its reliability will become lower due to the difficulty in ensuring the same conditions and environment for every trainee. In an extreme case, the results depend on the environment/conditions of the implementation and only trainees who are tested under the right conditions will succeed.

Economic efficiency is also in a trade-off relationship with adequacy, objectivity and reliability. The more you try to improve adequacy, the closer to the actual workplace the environment/conditions to be prepared becomes, but this will increase the cost of preparation. Similarly, the more you try to improve the evaluation method to enhance objectivity, the higher the cost of preparation becomes. Reproduction of the same environment/conditions to enhance reliability also increases the cost.

Therefore, it is necessary to examine the four functions and balance them within the range that convinces the concerned personnel who need the evaluation results. Adequacy is the most important when creating a balance, because evaluation results are not credible unless the adequacy is above a certain level.

The balance varies depending on the purpose of the evaluation. When deciding the value of trainees' ability, it is necessary to ensure high objectivity and reliability. If the purpose is to obtain information necessary to improve the lesson, a highly objective evaluation method may fail to provide detailed information. In such a case, you may deliberately employ

an evaluation method with low objectivity.

3.5.4 Relationship with the level evaluation

"2.4.1 Five levels of VT evaluation" provides "Table 2-15 Level Evaluation". The level evaluation is applicable also to training evaluation for trainees.

Table 2-15 (reproduced from 2.4.1) Level Evaluation

Level 1: Satisfaction evaluation	Are the trainees satisfied with the training?
Level 2: Evaluation of attainment level	Have the trainees achieved the attainment objective set for the training?
Level 3: Evaluation of utilization	Have the trainees put it into practice at their workplace what they learned in the training?
Level 4 : Evaluation of problem solving	Have the trainees succeeded in the problem-solving that was the training purpose?
Level 5: Cost performance	Does the cost of the training match the results?

However, training evaluation can check only up to Level 2 during the training duration, because Level 3 is possible only after completing the training and Levels 4 and 5 are evaluated by the national and local governments, companies, etc. who have the training needs. Level 1 depends on the level of trainee satisfaction. It is not about the ability acquired by the trainees.

Hence, training evaluation to be implemented during a training duration must be capable of judging Level 2.

3.5.5 Timing of training evaluation

Training evaluation is not only implemented just before the end of training to check whether the training objectives have been attained. Multiple minor evaluations are implemented in a single training course/lesson.

Training evaluation methods are divided in terms of timing as shown in Table 3-20. The individual methods in the table will be described later (3.5.6 Outline of evaluation methods).

Table 3-20 Timing and Methods of Training Evaluation

Timing	Evaluation method	Purpose
Multiple times during a lesson	Oral question Walking around the class	To check the procedure as planned or the trainees need additional training
At junctures throughout training	Written test Practical skills test	To check the learning status and consider the need for additional training items
Before the training	Written test Practical skills test Training assignment	To check whether applicants are equipped with the ability necessary to participate in the training
After the training		To certify that the trainees have mastered the training content

The evaluation, "Multiple times during a lesson" is performed at the breakpoints of training items or during practice in order to check whether you can proceed according to your class plan. The cost of preparation for this training evaluation is low and adjustment of the training implementation plan is easy. For this reason, it has an advantage of flexible implementation of training evaluation in accordance with the progress and conditions of the lesson. Taking only several seconds to several minutes, it does not require allocation of dedicated time and can be performed casually many times during lesson with little burden on the trainees.

The evaluation, "At junctures throughout training" is performed covering the content of multiple attainment objectives and training items. Therefore, it is implemented at the suitable points to summarize the training content. With a broader range of evaluation, it involves higher cost for preparation and requires allocation of time for implementation. In addition, the trainees may need time for practicing depending on the evaluation content. Therefore, it can be performed only several times during the VT course. However, it has an advantage of motivating trainees to learn and providing VT instructors with opportunity to consider how to improve the training.

The evaluation, “Before the training” is performed to check whether trainees are equipped with knowledge and skills to participate in the training. It includes screening tests for enrollment in the course and class placement tests. The evaluation, “After the training” is performed to certify that the trainees have mastered the training content and can use it on the job. In Japan’s public VT, trade skill verification mentioned in “1.3.3 (5) Trade skill verification” is implemented. Because both involve considerable cost, each of them can be implemented only once or so. Therefore, their development requires ample study.

3.5.6 Outline of evaluation methods

Evaluation methods are divided broadly into the following:

- Oral questions
- Walking around the class
- Written test
- Practical skills test
- Training assignment

This section describes the methods excluding training assignment, which is described in “3.6 Development of training assignment/training materials”.

(1) Oral questions

Oral questions refer to the method of asking trainees questions during lesson. This way, you can measure the degree of understanding of what you have taught on the spot and know whether to proceed as planned or to provide additional instruction, which enables prompt decisions on the development of the lesson. For this purpose, it is necessary to decide what to ask when making a class plan.

Oral questions have another advantage of making the lesson lively by adequately mixing questions into one-way explanations often conducted by VT instructors.

(2) Walking around the class

This is the method for VT instructors to evaluate the learning status of trainees by walking around their desks during the lesson to observe how they are learning. The method is used when trainees are carrying out group work or practice as well as during theory training. The evaluation method is practiced by VT instructors on a daily basis in Japan.

The method enables the VT instructor to know whether the trainees are involved in the lesson and to what extent they understand the lesson. VT instructors are expected to promptly analyze the observation results and improve the teaching method on the spot.

When walking around the class, the VT instructor is expected to check whether

- the trainees understand what is taught,
- there is no serious mistake in the work procedure,
- they are working with acceptance of the work procedure,
- they are cooperating with their teammates in doing the work, and
- the work is progressing at the planned speed.

If conditions are different from what is expected, promptly provide additional instruction. In this process, it is important to promptly find out whether a problem occurred only for the trainee in front of you or if it may occur for other trainees. If this is a problem only for the trainee in front of you, provide additional instruction to the trainee alone. However, if the problem may occur also for other trainees, give additional instruction to the entire class.

Because an error in this decision could greatly throw off the training schedule, it is important to make careful judgment of the whole situation by asking trainees to raise their hands if they are in a similar situation.

Walking around the class has the advantage of easily improving the lesson in addition to prompt additional instruction.

For example, if there is need for additional instruction for the entire class, you can alter your class plan and make additions to the planned explanations before beginning work. If the pace of the lesson is slower than planned, find out the cause while walking around the class and improve the class plan.

Most improvements found during a walk around the class are small instruction points that were not noticed when

developing the lesson plan. A collection of a large number of such small points will form know-how for instruction that will have a big impact on lesson development. Thus, walking around the class is the first step for discovering your own knowhow for instruction.

(3) Written test

In this test, trainees write their answers to test questions on paper. The tests are implemented to check whether they have acquired certain knowledge. Recently with the development of IT, answers can be entered without using paper. Questions may be presented in various ways including written sentences, oral presentation and moving images, but written sentences are used in most cases. Here, however, we will describe the case where both presentation of questions and answering are made on paper.

Types of written test are broadly divided into:

- Objective test methods and
- Subjective test method

①Objective test methods

In objective test methods, examinees write adequate technical terms in the answer section or choose correct answers from the given options. The test is highly objective because the evaluation results will be the same regardless of the markers. However, these tests are unsuited for evaluation of trainees' applied skills.

Advantages of objective test methods including those introduced above are:

- high level of objectivity, because the results are the same regardless of the markers,
- low cost of scoring because the scoring process is easy,
- evaluation results are not influenced by the trainees' skill in writing sentences, and
- easy statistical procedure for the evaluation results.

Their disadvantages are:

- suitable for evaluation of knowledge acquisition but not for evaluation of applied skills,
- necessary to prepare a large number of questions,
- necessary to prepare accurate and unambiguous questions, and
- examinees may choose the correct answer just by chance.

It is important to prepare tests in light of the above. Be forewarned that objective test methods may not be adequate for some purposes of evaluation.

Objective test methods are also divided into the reproduction method and the recognition method. In the reproduction method, trainees answer questions while recalling (reproducing) their memory. Fill-in-the-blank question is an example. In a recognition question, trainees answer questions while checking (recognizing) whether options are correct. True-False questions are an example of this type.

Below are examples of reproduction-type and recognition-type questions.

[Reproduction type--completion]

Complete the following sentence by writing the most appropriate words in ( ). 1 ampere means flowing of 1 (　　) per second of (　　).

[Reproduction type--enumeration]

Give the colors of the five-ring Olympic emblem. (1) (2) (3) (4) (5)

Rearrange the following planets in the order of their closeness to the sun.
Mars, Mercury, Jupiter, Venus, Saturn, Earth, Uranus and Neptune

[Reproduction type--calculation]

Calculate the time necessary to transfer 100M bytes of data at a transmission rate of 1Gbps through a LAN with a transmission efficiency of 25%.

[Recognition method—True-False question]

Write a circle in ( ) for a correct description about common keyboards. Write an x-mark in ( ) for an incorrect description.

1) The keyboard layout is called the ASCII layout. ( )
2) Upper/lower cases are designated using the Shift key. ( )
3) The “F” of the F1 key, etc. is an abbreviation of “Function”. ( )

[Recognition method—choosing one method]

Circle the correct answers among the following descriptions of specifications and estimations in construction and equipment installation works.

1) The priority order of specifications is common specification and special specification.
2) Special specification specifies general matters, equipment used and construction.
3) Design documents refer to drawings and specifications.
4) Direct construction costs include transport costs, equipment costs, construction costs and subcontract costs.
5) Common construction costs include temporary construction costs, field expenses and general administrative expenses.

(Source: Choosing one method [Example 1] on P. 172 of the 10th revised edition of “Theory and Practice of Vocational Training” edited by General Incorporated Foundation, the Vocational Training Material Research Center)

[Recognition method—combination]

Connect metric prefixes to the adequate numbers with lines to make correct combinations.

1) G	(a) 10^{12}
2) k	(b) 10^{9}
3) m	(c) 10^{6}
4) M	(d) 10^{3}
5) n	(e) 10^{-3}
6) p	(f) 10^{-6}
7) T	(g) 10^{-9}
8) μ	(h) 10^{-12}

[Recognition method—supplementation]

Choose the terms to fit into [ ] among A to F below.

The Internet is said to originate from [ ] developed under the leadership of the Department of Defense of the United States. This was the world’s first communication network using [ ].

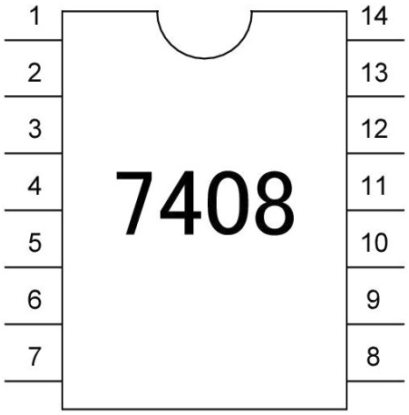
Later, the Internet was formed through the interconnection of networks using the [ ] technology. Numbers called [ ] are assigned to equipment connected to the Internet. Because these numbers are difficult to memorize for humans, they are converted to names (combination of host name and domain name) using a [ ] server.

The most commonly used Internet service is webpage browsing, which is realized using software called a [ ]. Other services include email and voice/movie streaming delivery.

A) ARPANET B) IP address C) Internet protocol
D) DNS E) packet F) browser

[Recognition method—Illustration]

Answer the output pin numbers in the logic IC of the following AND circuit.



②Subjective test method

A subjective test method is a type of written test where trainees freely write their answers to a given theme. Trainees are assigned to write an essay or their answers to questions such as “explain XX” using their own words.

The advantage of the subjective test method is that it enables comprehensive evaluation of the trainee’s ability to systematically express knowledge and the skill to apply the knowledge. Its disadvantage is that marking takes time because markers need to read all of the sentences written by each examinee using different expressions as their answers and the evaluation is easily influenced by the marker’s subjective view. Another disadvantage is that, if a question was not prepared carefully, the intention of the question could become ambiguous and the trainees could give answers that were not expected.

Therefore, when using a subjective test method, prepare questions and an evaluation method as follows to enable objective evaluation as far as possible:

- Prepare question sentences that clearly show trainees the intention of the question and the answer method and extent.
- Prepare an ideal answer beforehand and define elements of marking and point allocation.

(4) Practical skills test

Practical skills tests evaluate the level of skill acquisition by having trainees do the actual work. The work of the practical skills test described here is a model focused on specific elements. For example, in the case of a practical skills test of soldering, examinees solders elements on substrates but it is not necessary that the substrates operate as circuits.

The following items are the focus of evaluation in a practical skills test:

- Working result
- Working procedure
- Working attitude
- Working time

For “Working result,” the quality of the submitted products is evaluated. For “Working procedure”, whether the procedure is followed, rationality, efficiency and safety are evaluated. For “Working attitude”, the attitude toward safety, the improvement of quality, and the work efficiency are evaluated. For “Working time”, the time taken to complete the product is evaluated. Sometimes the time taken for each process or how many products the examinee can produce in a given amount of time are also evaluated.

A practical skills test is developed by the following procedure:

①Define skill items and evaluation content and consider evaluation methods.

②Define the assignment and prepare necessary drawings and blueprints.

③Estimate materials necessary for implementation of the assignment and decide the standard and number of machines, instruments and tools.

④Define the instruction and precautions necessary for the assignment work.

⑤Decide the standard for the evaluation.

If you develop a practical skills test plan just as a paper plan, you are likely to overlook something. Therefore, it is important for VT instructors to check the test by carrying out the actual work themselves.

Figure 3-7 is an example of a practical skills test.

Cut out the white figures printed on the three cardboard pieces below.

[Precautions]

- Tolerance from the edge of the printed figure should be within±1mm.
- The allotted working time is 30 minutes. Points are deducted if the time is exceeded.
- When one hour has passed, stop working and submit the work as it is.

Figure 3-7 Example of a Practical Skills Test

This practical skills test evaluates the achievement of the attainment objective, "capable of choosing the right tools and cutting out designated figures within a standard time frame". For this purpose, the results are marked out of 100 points in total for three items: accuracy, working time and work attitude. The relationships among the attainment objective, marking and evaluation criteria are as follows:

- Right selection of tools → work attitude/accuracy: evaluation of working procedure and attitude
- Designated figures → accuracy: evaluation of products
- Within a standard time frame → working time: evaluation of working time

More points are allocated to important items based on the relative weight of the attainment objective and product quality. Because it is essential that examinee finish the work accurately as shown with the figures and complete it on time, more points are allocated to accuracy and working time.

3.6 Development of Training Assignments/Materials

3.6.1 Training assignment

A training assignment is a kind of training material that shows practicing methods in writing and drawings so that trainees can practice elements of jobs, works and skills required in the workplace. Generally, training assignments are prepared by breaking down a job, or work to be done in the workplace into work and skill elements to enable practicing of individual elements. A system of assignments is built to enable practice of combinations of elements after practicing them individually in order to move eventually towards comprehensive practice of all elements.

In recent years, however, there has been an increase in training assignments designed to simulate an environment closer to actual working conditions, namely those that require simultaneous use of various work and skill elements for their comprehensive practice. In this section, the traditional assignment type and the latter problem solving assignment type are explained separately.

(1) Basic design concept of traditional assignments

Traditional training assignments include elementary and comprehensive assignments. The working content of elementary assignments is adjusted for the practice of elementary skills. Here, adjustment means setting assignments that are convenient for learning. Training assignments are not necessarily works carried out in an actual job. It is often necessary to adjust them to facilitate practicing.

Comprehensive assignments are based on works similar to those carried out in an actual workplace and can be completed by using a combination of many skill elements.

Traditional assignments are often designed to practice elementary skills through multiple elementary assignments and, after learning the individual elementary skills, to tackle comprehensive assignments so as to use multiple elementary skills as needed in realistic situations.

For example, the ability elements to ride a bicycle safely in actual traffic may have the following structure:

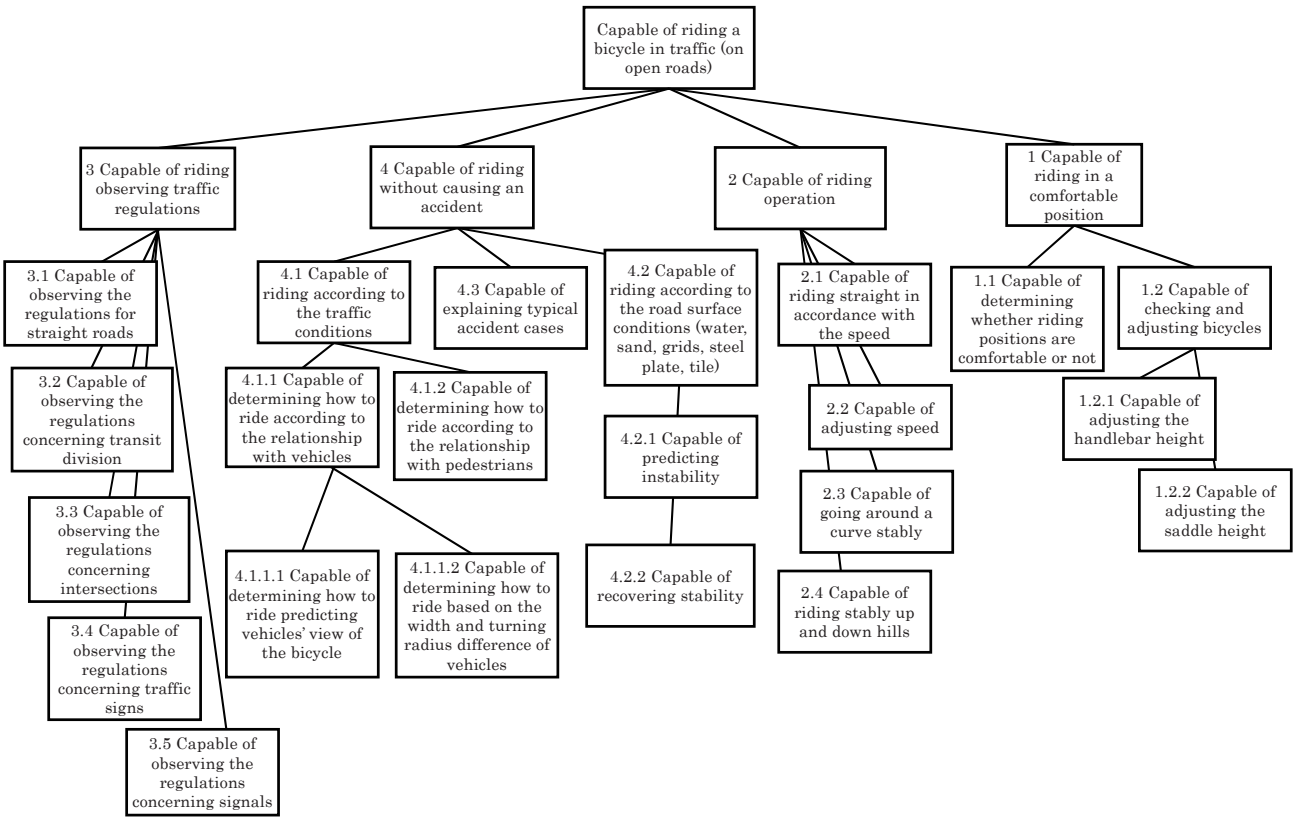


Figure 3-8 Structure of the Ability Elements to Ride a Bicycle

For instruction of training on the bicycle riding ability that has the structure above, training assignments may be organized as follows:

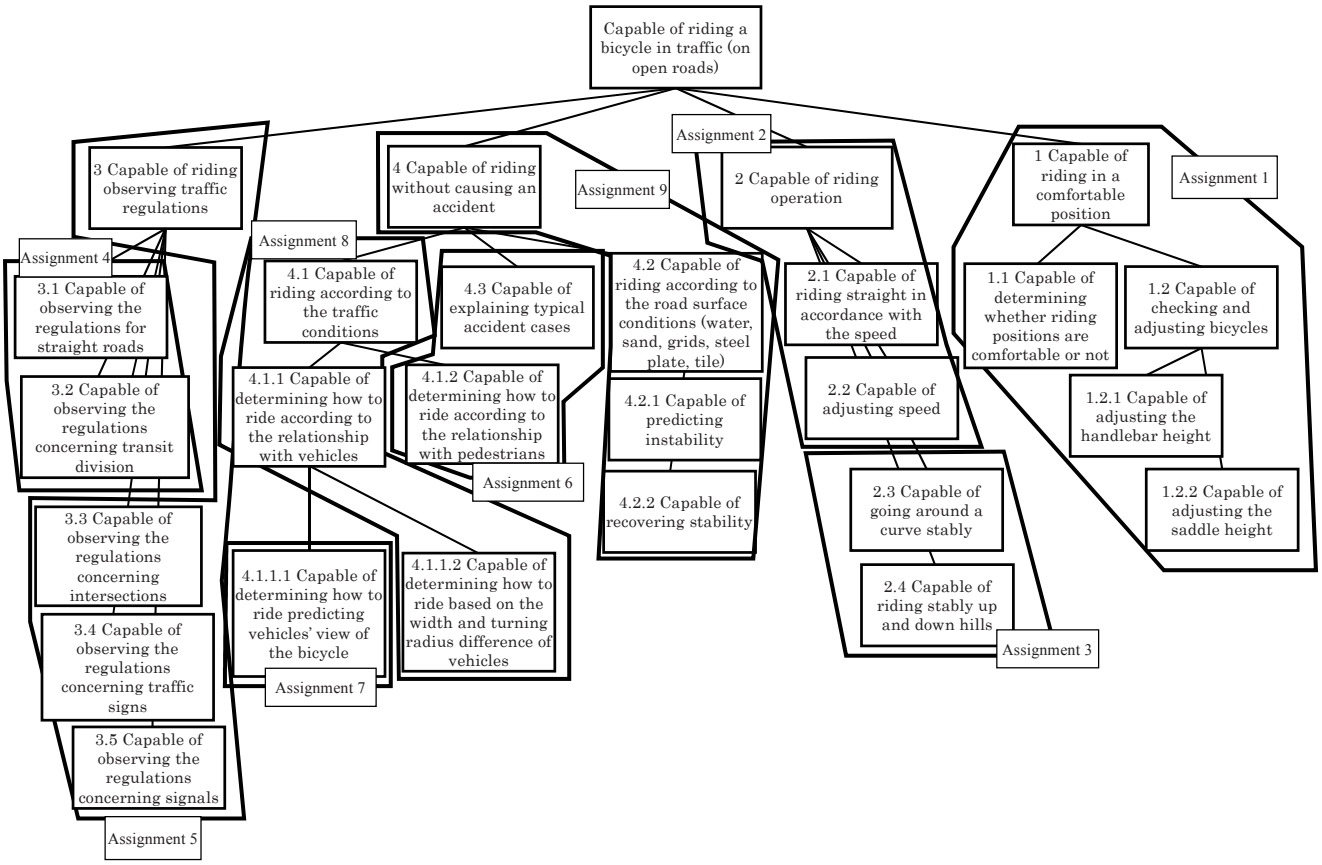


Figure 3-9 Example of the Structure of Training Assignments for Instruction of Bicycle Riding

Table 3-21 System of Training Assignments for Instruction of Bicycle Riding

	Assignment 1	Assignment 2	Assignment 3
Assignment name	Bicycle operation 1 (riding position)	Bicycle operation 2 (linear traveling and stopping)	Bicycle operation 3 (curves and uphill)
Attainment objectives	1 Capable of riding in a comfortable position 1.1 Capable of determining whether riding positions are comfortable or not 1.2 Capable of checking and adjusting bicycles 1.2.1 Capable of adjusting the handlebar height 1.2.2 Capable of adjusting the saddle height	1 Capable of riding operation 2.1 Capable of riding straight in accordance with the speed 2.2 Capable of adjusting speed	2.3 Capable of going around a curve stably 2.4 Capable of riding stably up and down hills
Assignment content	Experience the change in easiness of pedaling caused by adjusting the handlebar and saddle heights in order to set the standard of easiness. Practice handlebar and saddle adjustment to make adjustments to fit your physique.	Practice riding straight on a straight road and freely increase or decrease speed.	Practice riding stably around curves, uphill and downhill.

	Assignment 4	Assignment 5	Comprehensive Assignment 1
Assignment name	Regulations 1 (road travelling and transit division)	Regulations 2 (intersection, traffic signs and signals)	Riding observing regulations
Attainment objectives	3.1 Capable of observing the regulations for straight roads 3.2 Capable of observing the regulations concerning transit division	3 Capable of riding observing traffic regulations 3.3 Capable of observing the regulations concerning intersections 3.4 Capable of observing the regulations concerning traffic signs 3.5 Capable of observing the regulations concerning signals	1 Capable of riding in a comfortable position 2 Capable of riding operation 3 Capable of riding observing traffic regulations
Assignment content	Practice of riding according to the regulations concerning straight roads and transit division on a model road cut off from traffic. Not including intersections and roads with obstacles requiring high-level operation.	Practice of riding according to the regulations concerning intersections, traffic signs and signals on a model road cut off from traffic. Later carry out comprehensive practice including regulations concerning straight roads and transit division.	Practice of riding 1) with a comfortable position, 2) correct operation and 3) observing regulations on a model road cut off from traffic, which is followed by evaluation.

	Assignment 6	Assignment 7	Assignment 8
Assignment name	Accident prevention 1 (riding without accidents involving pedestrians)	Accident prevention 2 (riding that allows the rider to be easily be seen by other vehicles)	Accident prevention 3 (riding while giving consideration to other vehicle's characteristics)
Attainment objectives	4.1.2 Capable of determining how to ride according to the relationship with pedestrians 4.3 Capable of explaining typical accident cases	4.1.1.1 Capable of determining how to ride predicting vehicles' view of the bicycle	4.1 Capable of riding according to the traffic condition 4.1.1 Capable of determining how to ride according to the relationship with vehicles 4.1.1.2 Capable of determining how to ride based on the width and turning radius difference of vehicles
Assignment content	Introduction of typical accident cases followed by the practice of riding a bicycle predicting the movements of pedestrians on a road used both by bicycles and pedestrians.	Practice of riding on a course visible for drivers while keeping an adequate distance from vehicles on roads of various shapes (straight road, big/ small intersections, curves, stop position of a traffic signal crossing, etc.) predicting how drivers will see the bicycle.	Practice of prediction of how vehicles enter the course of the bicycle depending on their width and turning radius difference and practice of riding based on the prediction.

	Assignment 9	Comprehensive Assignment 2	Comprehensive Assignment 3
Assignment name	Bicycle operation 4 (How to identify dangerous road surfaces)	Comprehensive Assignment for accident prevention	Comprehensive Assignment for bicycle operation
Attainment objectives	4 Capable of riding without causing an accident 4.2 Capable of riding according to the road surface conditions (water, sand, grids, steel plate, tile) 4.2.1 Capable of predicting instability 4.2.2 Capable of recovering stability	4 Capable of riding without causing an accident	Capable of riding a bicycle in traffic
Assignment content	Practice to predict slippery road surface and risk of losing steering control. Practice to adjust speed with adequate braking force and respond to brake locking.	Prepare a model road that is cut off from traffic and includes 1) pedestrians, 2) automobiles and 3) road surface conditions in a composite manner and assign practice of riding that suits each situation.	Prepare a model road for: 1) riding observing regulations 2) traffic with automobiles and pedestrians, and 3) road surface conditions in actual traffic and assign practice of riding.

"Assignments 1 to 9" above are elementary assignments while "Comprehensive assignments 1 to 3" are comprehensive assignments. "Comprehensive assignment 1" requires simultaneous use of all skills acquired in "Assignments 1 to 5". "Comprehensive assignment 2" requires simultaneous use of all skills acquired in "Assignments 6 to 9". "Comprehensive assignment 3" is designed as requiring simultaneous use of all skills acquired in "Assignments 1 to 9".

When planning a system of assignments using traditional methods, create a list of contents to be learned based on the target analysis and job breakdown, make a plan to enable learning of their elementary skills in order, and then let trainees tackle comprehensive assignments with a combination of multiple elementary skills in the latter half of the training.

(2) Example of problem solving assignment

In recent years, there has been a type of training assignment of having trainees solve problems in the workplace so that they can acquire necessary skills through the process. The method is called PBL (Problem Based Learning or Project Based Learning).

In the case of the bicycle riding training above, trainees are first given "Comprehensive assignment 3" to experience the fear of riding parallel to an automobile, then they work at "Assignments 7 and 8" for prevention of accidents involving automobiles. Another method is, without setting assignments with explicitly elementary works such as "Assignments 7 and 8", to have the trainees who think about how they can ride safely parallel to an automobile while the VT instructor provides only the information asked by the trainees. This means that there is PBL with predetermined items to learn and PBL without such predetermined items.

In PBL with predetermined items to learn, relevant items and a group of assignments are set beforehand based on a target analysis, etc. Contrary to the order of assignments of the conventional method, a comprehensive assignment is given first. This method enables learners to know beforehand the actual situations in which they can use what they will learn. Because they are not capable of doing the task necessary for this purpose, their motivation to learn will be enhanced.

PBL without predetermined items to learn is a good method to learn what you don't know or can't do now and acquire the attitude of active learning. On the other hand, learners may solve the actual problems in a half-baked way and finish the assignment without acquiring the expected ability. Therefore, it is necessary to consider the purpose and conditions when introducing PBL or problem solving assignments.

3.6.2 Training materials

(1) Types of training materials

Training materials can be roughly classified into teaching aids, text type and assignment materials.

Teaching aids are used to assist oral explanation by the VT instructor during a lesson. They include slides, images and movies displayed using a projector. Text type materials are printed matters describing the content of instruction comprehensively and systematically. Assignment materials describe how to proceed with assignments that are given to acquire certain skills.

Below are explanations of each type of training material.

(2) Teaching aids

①Creating teaching aids

Teaching aids are used to supplement things that are difficult to communicate through oral explanation alone. In recent years, they are typically created using presentation software on a PC but you can create effective teaching aids using the following audiovisual aids.

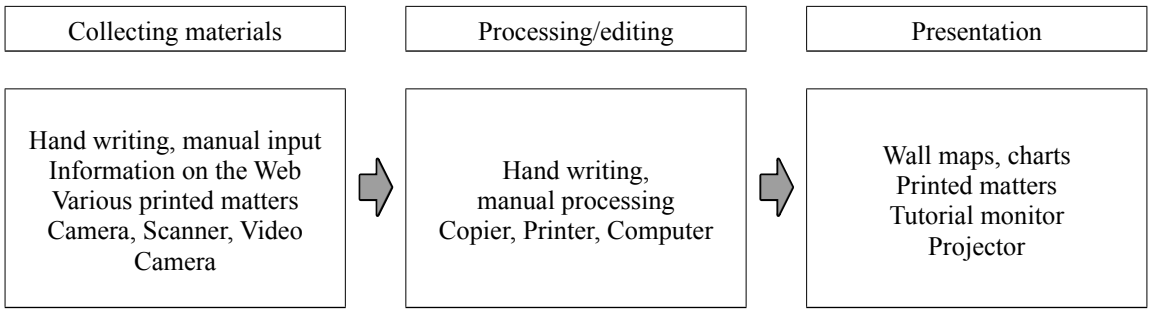


Figure 3-10 Audiovisual Aids Easily Available in Recent Years

Teaching aids have four functions as shown below. When using them in a lesson, make full use of these functions.

②Functions of teaching aids

a) Helping understanding

Sometimes it may be difficult for the trainees to imagine a situation by just listening to the oral explanation, however they may understand it at once by looking at a picture or illustration. For example, you can imagine easily that a person who does not know about aircraft would understand what an aircraft is more quickly by looking at its photo or an animated film rather than by hearing an oral explanation. This way, teaching aids can help the trainees with understanding.

b) Bringing a sense of reality to the classroom

The best way to explain what an actual aircraft is may be to bring the trainees to an airport to look at an aircraft, hear the sound it emits, and watch a large number of passengers boarding the aircraft and watching it finally fly into the sky. However, you can't go to the place actual things are every time you need to explain something, because the lesson hours are limited. Pictures and animated films can simulate what you want them to feel at an actual place.

c) Motivation

Showing unfamiliar things and interesting motions using a projector or monitor is useful to motivate trainees.

d) Assisting lesson procedure

Arranging teaching aids in the order of explanation or preparing space in the teaching aids for Q&A with trainees may help lesson procedures.

③Consideration when creating and using teaching aids

a) Clear positioning

It is necessary to check whether the teaching aids are clearly positioned in the process of the training, are adequate to explain the content and presented in a manner to attract attention to the intended points. For example, when explaining the principle of aircraft flight, an "illustration" showing the air flows differing on the upside and downside of a model wing will help understanding more than a photo of an actual aircraft flying or an actual aircraft wing. It is necessary to identify what to bring to the attention of the trainees and create teaching aids that help them to understand.

b) Speed of presentation

Because OHPs and other projectors can quickly present a large amount of information, you can ensure effective use of limited time. However, it will take considerable time if you make trainees read or transcribe them. You have to pay

attention to the number of words on one presentation page.

c) Clearly specify whether trainees need to take notes or not

Trainees may not need to take notes of the contents of teaching aids depending on the purpose of the presentation. Thus, it is necessary to tell them if they need to take notes or not.

d) Setting

Set the equipment to ensure good visibility for all trainees by paying attention to brightness, lighting, outside light, obstacles and presentation size, etc.

e) Preparation of equipment

Troubles such as the projector light bulb going out and failure to playback videos will pose a major impediment to the training procedure. Ensure daily maintenance, prepare spare light bulbs and check how to use equipment.

(3) Text type materials

①Features of text type materials

Text type materials are printed matters describing knowledge items comprehensively and systematically in the order required by the content. This GAIN is a typical text type material. Books on the market or texts specially edited or created for the training may be used as text type materials. In either case, it is necessary to use texts describing the necessary information for the training.

If books on the market do not completely cover the necessary information, the lacking information may be added as a separate material.

When editing or creating a text type material for a specific training course, you can carefully select the necessary information for the content. For example, a text type material on drawing ruled lines with spreadsheet software could have the following table of contents:

X. Drawing ruled lines
- X.1 Relationship between lines and cells
- X.2 Outline of how to draw ruled lines
- X.3 How to select a cell
- X.4 Position of ruled lines to the selected cell
- X.5 Types of ruled lines (style, thickness and color)
- X.6 Procedure of creating a complicated table (not displaying some ruled lines)

You can add an assignment material described in "(4) Assignment material" to each unit of a text type material. By creating a text type material this way, you can use one textbook both for explanation and practice in accordance with the progress of the training.

A text type material with assignment materials could have the following table of contents:

X. Drawing ruled lines
- X.1 Relationship between lines and cells
- X.2 Outline of how to draw ruled lines
  - Assignment X1: How to draw simple ruled lines
- X.3 How to select a cell
- X.4 Position of ruled lines in relation to a selected cell
- X.5 Types of ruled lines (style, thickness and color)
  - Assignment X2: Practice drawing various ruled lines
- X.6 Procedure of creating a complicated table (not displaying some ruled lines)
  - Assignment X3: Practice creating complicated tables

②How to create text type materials

Text type materials are printed matters listing knowledge items based on a certain system similar to that of a dictionary. They are not something you want to read from beginning to end. They are mostly used for searches as needed.

Therefore, it is necessary to design contents ensuring ease of search. Important points for this are creating a table of contents and sticking to a fixed style for description of individual items. As an example of style, text-type material on the spreadsheet software illustrated above is shown below. The style of this material is to title all items in the same way, describe

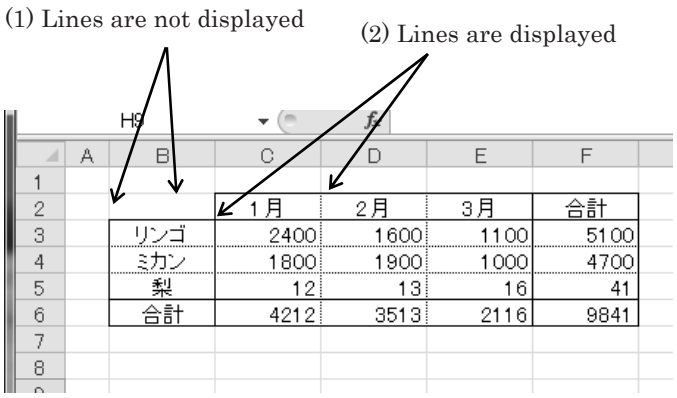
the outline of each item, and place illustrations on the left and explanations on the right and give hints, etc.

Text on spreadsheet software

X. Drawing ruled lines

X.1 Relationship between lines and cells

This section explains the relationship between cells and ruled lines drawn with spreadsheet software.



Lines of spreadsheet software are drawn by selecting display or non-display of lines on the left, right, top and bottom of the cell.

In (1) of the left table, lines on the left and top of the cell are not displayed whereas lines on the bottom and right are displayed (2).

Hint: The key task of drawing ruled lines is to plan which cells to select and which of the lines surrounding the cell to display based on an image of the table to be created.

Figure 3-11 Example of Text-Type Material Style

(4) Assignment materials

Assignment materials describe how to practice the assignments that are given to acquire skills. Training materials explaining only the work procedure of a certain work are text type materials. Assignment materials describe the procedure of the practice to learn.

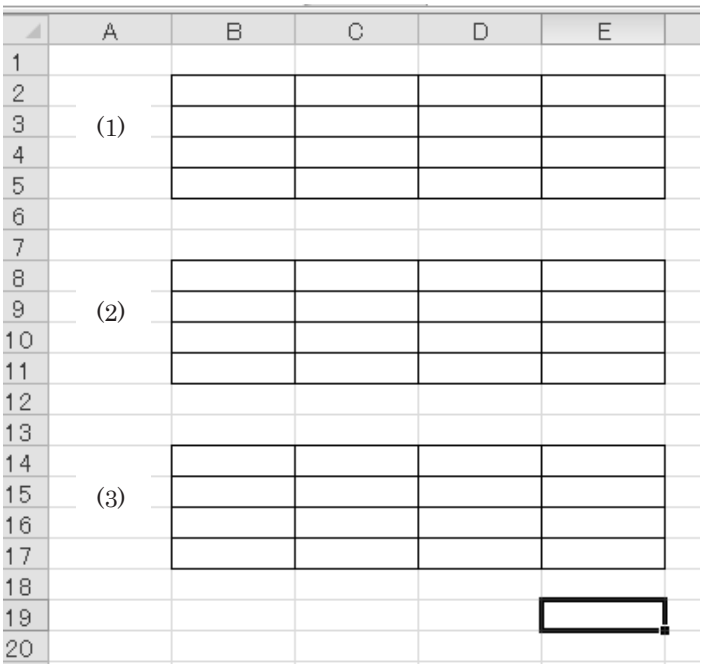
Design the assignment contents to enable the practicing necessary to achieve the attainment objective set for the lesson. It is not necessary to give a detailed description of the procedure of the work provided in a textbook, etc. but rather to clearly demonstrate the procedure of the practice.

Figure 3-12 is an illustration of an assignment material.

Assignment materials for practice of spreadsheet software

X. Drawing ruled lines

Assignment X2 Practice drawing various ruled lines



Assignment 1
Draw ruled lines in the order of (1), (2) and (3).
Outline of the work procedure
First, select cells B2 to E5, then select "cell format" → "ruled line" by clicking the right mouse button to draw the ruled lines.
Draw ruled lines also in cells from B8 to E11 and B14 to E17 in this order.

Assignment 2
Erase the ruled lines drawn in Assignment 1. Then select the cells of (1), (2) and (3) simultaneously by dragging while pressing the CTRL key to draw the ruled lines.

Assignment 3
First, erase the ruled lines drawn in Assignment 2. Select any of the four corners of the rectangle and then select (1), (2) and (3) simultaneously to draw the ruled lines by Shift key+cell selection.

Points of the practice
Repeat practice until you can freely select cells for which to draw ruled lines.
Become capable of selecting the start and end cell points by any of mouse click, mouse drag or cursor movement.
Combine simultaneous selection and range selection using the CTRL and Shift keys.

Figure 3-12 Example of an Assignment Material

3.7 Development of Class Plans

3.7.1 Class plans

A class plan is a plan on the content provided per unit of time. For example, if a lesson runs for 60 minutes at a time, a goal to be reached in these 60 minutes is set and the instruction method is planned.[2] The developed class plan is summarized in the lesson plan as introduced in Table 1-8 (See 1.4.3 Development).

A class plan not only decides the lesson content, but should also consider such points as whether the content fits in the designated time, whether it can be implemented with the facility & equipment and training materials prepared, whether the trainees can understand it, and whether it is consistent with the purpose and objectives of the lesson. That is, the plan not only includes lesson preparation but it also has the aspect of verification before starting the lesson. This means that cases in which problems are not noticed until after the lesson starts can be reduced as much as possible, and at the same time the efficiency of training can be raised.

(1) Six items that make up the class plan

The major elements composing the class plan are the following six.

- Purpose of the lesson
- Attainment objective of the lesson
- Training item of the lesson
- Readiness of trainees and information on facility & equipment and training materials
- Procedure of the lesson
- Training hours allocation in the lesson

The lesson plan introduced in Table 1-8 shows the above six items, as shown in Figure 3-13 below.

2 Although a class plan for the unit of 60 minutes is decided here as an example, you do not need to always divide the plan based on the lesson time. For instance, if you need three 60-minute lessons to teach a certain training item, you prepare a class plan combining the three lessons together.

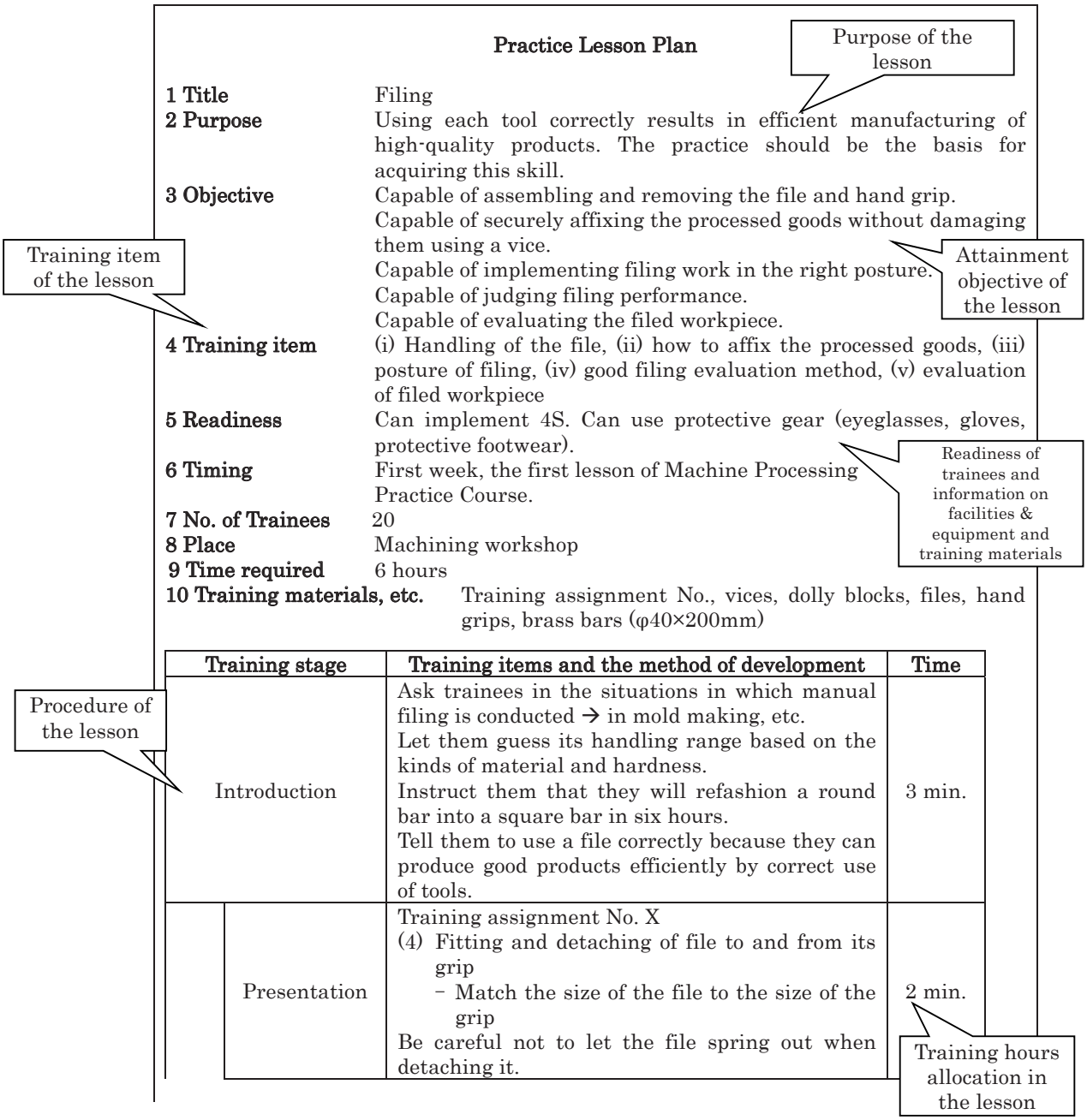


Figure 3-13 Six Items Shown in the Lesson Plan

(Source: Prepared from the sample practice lesson plan on p. 121, Figure 2-37, of the 10th revised edition of "Theory and Practice of Vocational Training" edited by General Incorporated Foundation, the Vocational Training Material Research Center)

The "purpose of the lesson" part should include the purpose of implementing the lesson. However, you should not give vague purposes such as "because it is necessary for XX work" or "because it is frequently used in XX". You should give the specific purpose. It is important that the trainees understand the purpose, feel the need to take the lesson, and are able to imagine themselves utilizing the skills to be learned at their work place. By doing so, the purpose can be utilized in the lesson as a strong motivation for the trainees.

The "attainment objective of the lesson" part should include the ability to be attained after taking the lesson. How the attainment objective should be described here is explained in detail in "3.4.2 Attainment objectives and training items", so it is not repeated here, but it is important to describe the attainment objective in a way so that others can measure whether the trainee has reached the attainment objective or not.

The "training item of the lesson" part should include items to be instructed so as to achieve the attainment objective of the lesson. The further segmented training items are set, because the training items are too broad and general at first. Thus, it is possible that trainees are trained on multiple training items to reach the single attainment objective of the lesson. It is

also possible that the training hour for a single training item is about 5 to 10 minutes.

The "readiness of trainees and information on facility & equipment and training materials" part should include information necessary for implementing the lesson smoothly. Readiness refers to the minimum ability that the trainee should have in order to take the lesson. It is important that this point is clarified, because the class plan is prepared on the premise that the content of readiness does not need to be instructed. Therefore, if there are any trainees who do not fulfill the readiness, the lesson cannot be carried out as scheduled. At worst, the trainees may not finish any of the assignments.

The "procedure of the lesson" is the most important item of the class plan. It includes what the VT instructor should instruct in a single lesson. It is important to describe the procedure by considering how the training items should develop in order for the trainees to reach the attainment objective efficiently, and try not to simply list up what should be done. Thus, it is necessary to consider the training contents according to the method used to carry out the lesson, the order of instructions, and the types of abilities.

(2) Confirmation of the preparation procedure and consistency

The description of the "procedure of the lesson" usually takes up a few pages. It is recommended that it is prepared in the following procedure.

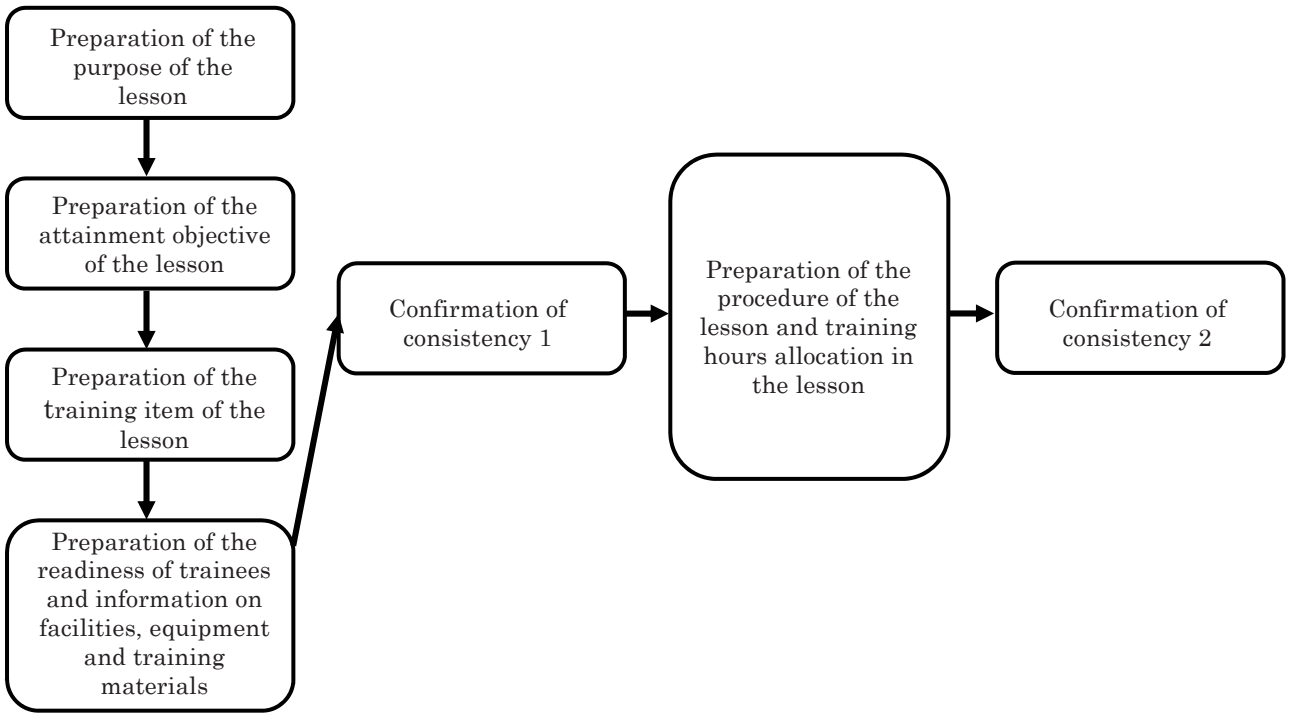


Figure 3-14 Procedures for Preparing a Class Plan

A class plan not only represents a plan for carrying out lessons, but also has an aspect of verification before starting the lesson. That is because the class plan is prepared by confirming whether there will be any problems with the implementation of the lesson. However, it is insufficient to just confirm the items you are working with; it is necessary to also confirm comprehensive consistency. In the procedures shown in Figure 3-14, two times for confirming comprehensive consistency are set: confirmation of consistency 1 and 2.

In the stage of "confirmation of consistency 1", the comprehensive consistency is confirmed for four items: namely the "purpose of the lesson", "attainment objective of the lesson", "training item of the lesson" and "readiness of trainees and information on facility & equipment and training materials". The major items to be confirmed are as follows.

- Whether there is consistency between the purpose and the attainment objective of the lesson
- Whether all training items necessary to achieve the attainment objective of the lesson are included
- Whether all training items can be covered within the lesson time
- Whether training on all training items can be implemented with the prepared facility & equipment and training materials

- Whether all the trainees can fulfill the readiness at the time the lesson starts
- Whether the difference between the readiness of trainees and the attainment objective of the lesson can be reasonably eliminated with the training
- Whether a sufficient quantity of facilities & equipment and training materials are secured against the number of trainees

  Confirm all the above items and correct any inconsistencies.

In the stage of "confirmation of consistency 2", mainly the consistency of the "procedure of the lesson" and the "training hours allocation in the lesson" are confirmed with the other four items. The major items to be confirmed are as follows.

- Whether the parts explaining the purpose of the lesson are included in the procedure of the lesson
- Whether the parts confirming the achievement of the attainment objective of the lesson are included in the procedure of the lesson
- Whether the method confirming the attainment objective of the lesson has consistency
- Whether training on all training items is being provided
- Whether the parts beyond the scope of the readiness of trainees are explained
- Whether the training is implemented with only the prepared facility & equipment and training materials
- Whether all prepared facility & equipment and training materials are used
- Whether the training hours allocation or the quantity of facilities, equipment and training materials are adequate for the number of trainees

  Similarly, confirm all the above items and correct any inconsistencies.

By confirming the consistency at these stages, it is possible to reduce cases in which problems are not noticed until after the lesson starts as much as possible. That is, the confirmation can prevent major mistakes that may cause confusion in the lesson. This not only allows the VT instructor to concentrate on instructing the trainees during the lesson, but also helps them to detect smaller mistakes and improve the upcoming lesson.

3.8 Case Examples

3.8.1 Case examples of training evaluation

JEED uses the training plan format such as Table 3-22 and includes training objectives and training evaluation in all training plan formats. Table 3-22 shows the training plan related to handling electric power tools and woodworking machines which is implemented for three days of a six-month VT course related to housing service. JEED calls this three-day training contents “Unit”, and calls this format showing training plan of unit “Unit Sheet”. In Table 3-22, the following three things are the attainment objectives.

(1) Capable of handling electric power tools

(2) Capable of handling woodworking machines

(3) Capable of implementing work safely and hygienically

Three attainment objectives described above can be used as evaluation standards for self-evaluation and VT instructor’s evaluation. After finishing courses, as a self-evaluation, trainees check whether they have achieved the attainment objectives through a five-grade evaluation or yes/no questions. Trainings are implemented by using practice textbooks and work standards sheets. By visualizing the work process in them, an effort is being made to let everyone work safely, effectively and efficiently. Therefore, the standards of self-evaluation by trainees are different from ability evaluation by VT instructors, but it is implemented with some degree of accuracy.

Also, by including the self-evaluation column by trainees to the unit sheet and providing unit sheets to trainees before starting training, the following effects are expected.

(1) Make trainees realize which level they have to reach, and give them motivation towards trainings.

(2) Have trainees recognize their skill acquisition condition after finishing training, for encouragement for their future training.

VT instructors evaluate them by standards. For example, the instructor certifies “good” if the trainee was able to do 80% or more of the work.

Table 3-22 Example of Unit Sheet

Unit	Handling electric power tools and woodworking machinery	Classification number	HU105-0060-1	Self-evaluation	Confirmation by the VT instructor
	(1) Capable of handling electric power tools				
	(2) Capable of handling woodworking machinery				
	(3) Capable of implementing safety and health work				
Details of training subject	Details			Training hour	
				Theory	Practice
How to use electric power tools	(1) Electric circular saw (2) Electric planer (3) Electric drill (4) Electric square chisel			1	6
				2	16
Machinery and tools used	Various kinds of electric power tools and woodworking machinery				

(Source: Excerpt from the curriculum model of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/CurriculumModel/)

(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

3.8.2 Case examples of training assignment (including development assignments)

(1) Case example of conventional training assignment

The conventional impression of a training assignment in VT is that the assignment is given mainly in terms of manufacturing so as to confirm whether the trainees acquire the attainment objective learned during the training duration. Therefore, assignments to be completed by combining the skill elements acquired so far are usually developed.

Here we introduce the following training assignment as a case example.

Web Server Building Assignment

Assignment 1. Wiring LAN cable and setting the IP address of the router

Build a LAN cable yourself and connect each device as shown in Figure 3-15. Then, set the IP address of the router.

Assignment 2. Installing OS and setting the IP address of PCs

Install Linux in the PC used as a server. Then, set the IP address of each PC as shown in Figure 3-15.

The host name of the PC used as a server is:…

Assignment 3. Setting the web server and DNS server

Set the web server and DNS server so that both are operable on the PC used as a server. The setting of the web server is:…

Assignment 4. ([Omitted] The assignment continues until the network is completed.)

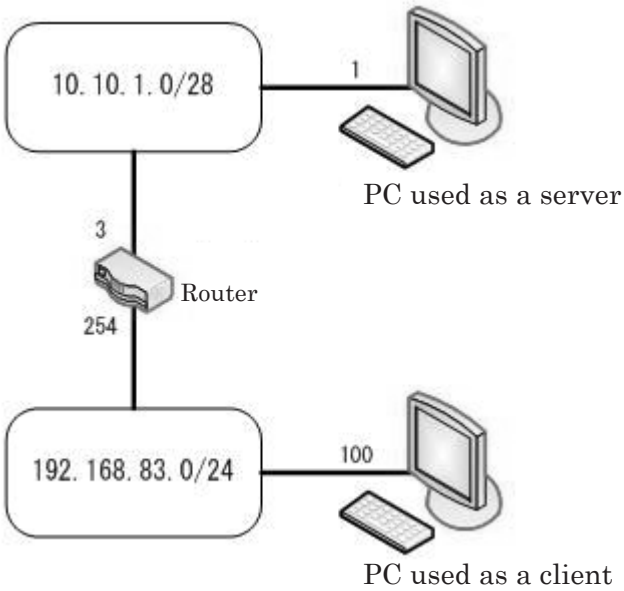


Figure 3-15 Network Connecting Diagram

Before starting this training assignment, the trainees have acquired each skill element in the order shown in Figure 3-16. In each training session, training materials modeled to facilitate the learning of skill elements were used. Then the trainees experienced combining the skill elements comprehensively in the training assignment.

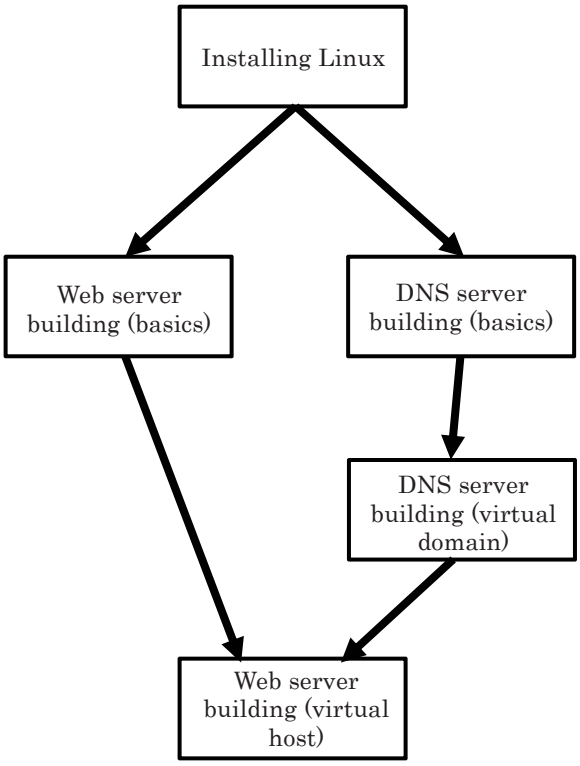


Figure 3-16 VT Courses Implemented Before the Training Assignment and Their Order

(2) Case example of recent training assignment

There is also a type of VT that implements a new style of training assignment that is different from the conventional image of the training assignment. In such new training assignments, trainees discover the necessary skill elements to learn on their own, instead of each skill element being taught one by one.

For example, the same content of web server building assignment as introduced in (1) above will be given in a new style as follows.

Company A is considering the building of a new web server. This web server can be used both from outside the company and in-house. However, it is necessary to separate the accesses from within the company and those from outside the company, and to allow browsing access only from within the company on the in-house exclusive web page.

In addition, Company A newly obtained the domain “test.gain”, and decided to also build a DNS server.

Due to financial reasons, the company can prepare only one PC as a server. The company also wishes to realize the plan at as low cost as possible.

Therefore, as a project team accepting the order from Company A to build the network, plan and complete the network building that fulfills the demands as explained above.

As for detailed specifications that are not explained above, decide them through meetings with Company A.

Clearly, the amount of instruction and information is far less than (1). However, it is a practical assignment.

This is because the assignment is given in order for the trainee to consider the entire cycle by him/herself, including planning, design, device procurement, and development. In the course of solving this training assignment, the trainees experience issues such as the roles within the team, methods for information gathering and analysis, awareness of cost, method of studying unknown skills, and meetings with supervisors and clients.

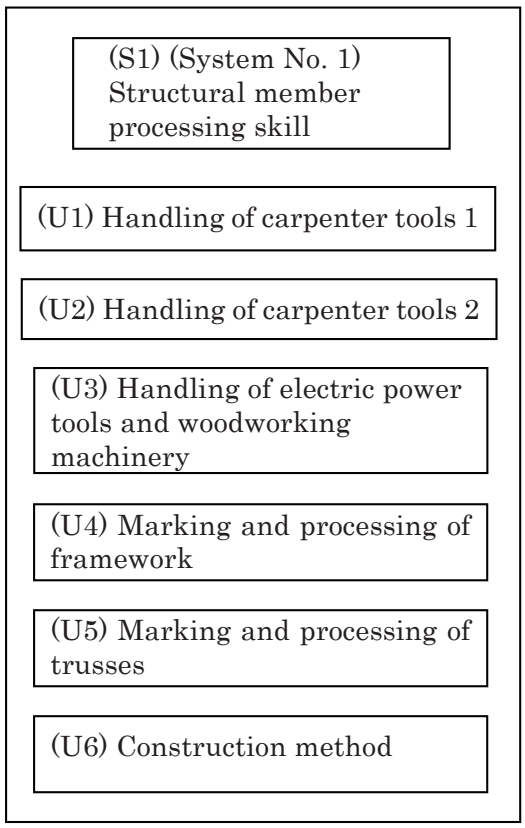
The VT instructor will participate in the team in roles such as trainee’s supervisor or client, and will control the project planned by the trainee, so that it can be finished without problems.

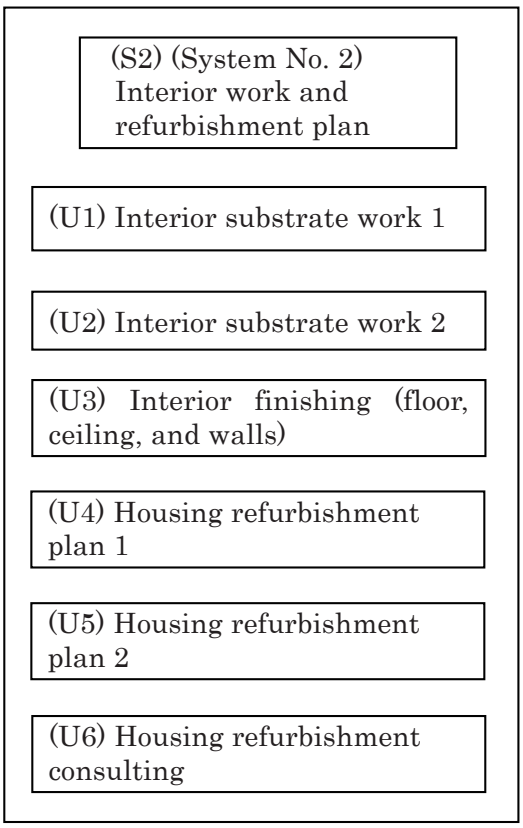
3.8.3 Case examples of assignments and training materials

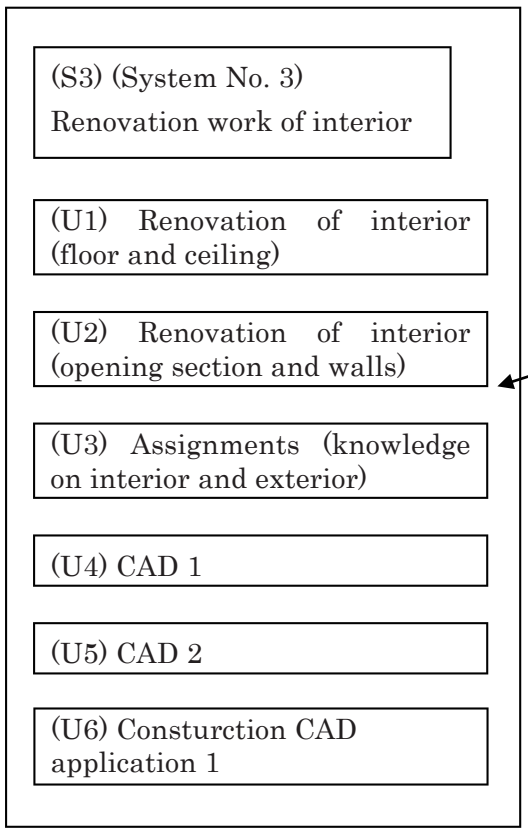
(1) Example of making up assignments

JEED plans training so that trainees can be able to do a certain work in three months. Table 3-23 shows a training plan related to framework construction for housing and interior finish work for three months. The set titled “System” is training for a month, and each system (S1 to S3) is comprised of six units labeled U1 to U6 respectively. One unit is a set for a three-day training.

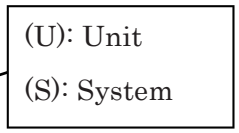
Table 3-23 Example of Breakdown of System Unit Training
(training plan related to construction of the structure of housing and interior finish work for three months)







(Note) Framework: Structure to support the load by combining rod-shaped members such as pillars and beams



(2) Example of comprehensive assignments

Figure 3-17 and Figure 3-18 are examples of constructing a mock house to implement the three-month training mentioned in the previous section. For constructing a mock house, assignments to reach to the training objective of each unit were set and practices are also included in the unit. For example, the wall of the mock house on the left of Figure 3-17 shows the result of practicing S2U1 “Interior substrate work 1” of Table 3-23. The white wall of Figure 3-18 shows the same place as Figure 3-17. This is the result of practicing S2U3 “Interior finishing (floor, ceiling, and walls)”.

This example of comprehensive assignments: constructing a mock house is set to include assignments to reach all training objectives; from U1 “Handling of carpenter tools 1” to U6 “Construction method” of S1 “Structural member processing skill”, from U1 “Interior substrate work 1” to U6 “Housing refurbishment consulting” of S2 “Interior work and refurbishment plan” and from U1 “Renovation of interior 1 (floor and ceiling)” to U6 “Construction CAD application 1” of S3 “Renovation work of interior”. As there are several types of construction methods for constructing a mock house, some elements which are not set in S1 to S3 are not included.

In the trainings from S1 to S3, assignments can be developed respectively by unit. However, training to construct a mock house is developed as a comprehensive assignment. For example, the trainees can study S1U1 “Handling of carpenter tools 1” practically in S2U1 “Interior substrate work 1” and S2U3 “Interior finishing” so that they can keep practicing to become proficient at “Handling of carpenter tool”. In the same way, S2U3 “Interior finishing (floor, ceiling, and walls)” and S3U2 “Renovation of interior (opening section and walls)” are effective training assignments because the relationship between the 2 units becomes stronger as part of a comprehensive assignment such as constructing a mock house.

Figure 3-17 Mock House

Figure 3-18 Inside the Mock House

(3)Examples of assignment materials

Figure 3-19 shows the example of assignment material using for S1U4 “Marking and processing of framework” in Table 3-23.

It shows the practice procedure to acquire the skill of marking of framework, the processing and assembling of the joint part between the pillar and the bedding for constructing a mock house.

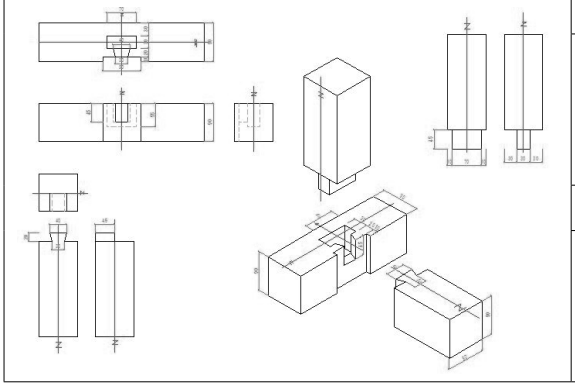
Marking of the framework	
	Assignment 01
	Mark and process the wood (105 × 105 × 4m) for half-lap dovetail joints.
	Assignment 02
	Mark and process the wood (105 × 105 × 4m) for dovetail dado joints.

Figure 3-19 Example of an Assignment Material

Figure 3-20 shows the example of a blueprint drawing assignment needed for constructing a mock house and the example of assignment materials using for S2U4 “Housing refurbishment plan 1” in Table 3-23. This is an assignment where trainees are shown the drawing of Figure 3-20 and examples of refurbishment in order to have them think about what construction (judgment whether they need to repaper boards, or they just adjust the substrate) is needed, and requires them to compile as housing refurbishment plan. CAD is used for drawing and it is used as assignments S3U4 “CAD1” and S3U5 “CAD2” in Table 3-23.

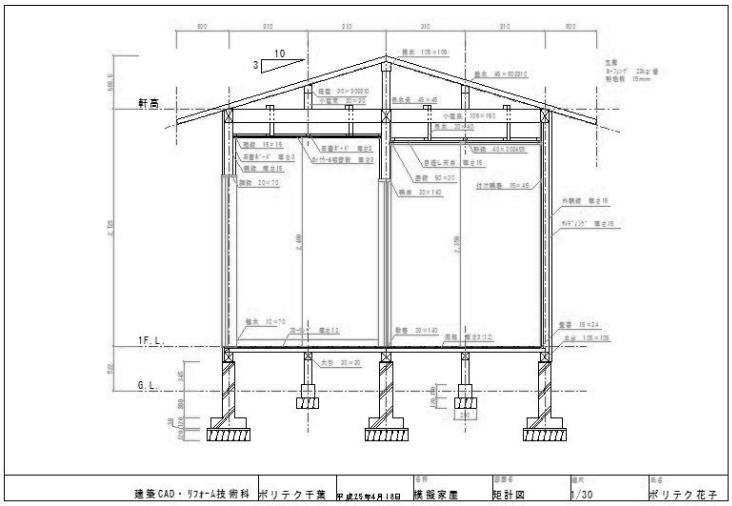


Figure 3-20 Mock House Drawing

(4) Examples of text type material

Table 3-24 shows the example of text type material used for lectures concerning the overall image of the works before starting S2U3 “Interior finishing (floor, ceiling, and walls)” in Table 3-23. After grasping the overall image of the works, trainees will proceed with the work.

Table 3-24 Example of Text Type Material

S2 Interior work and refurbishment plan
U3 Interior finishing (floor, ceiling, walls)

(3)Types and construction methods of interior wall finishing

1. Materials
   (1) Types of wallpaper (cloth wallpaper, vinyl chloride wallpaper, Japanese paper, etc.)
   (2) Wallpaper adhesives
2. Substrate material to be constructed
   (1) Gypsum plaster board (ceiling material 9.5mm, wall material 12.5mm)
   (2) Structural plywood
3. How to affix

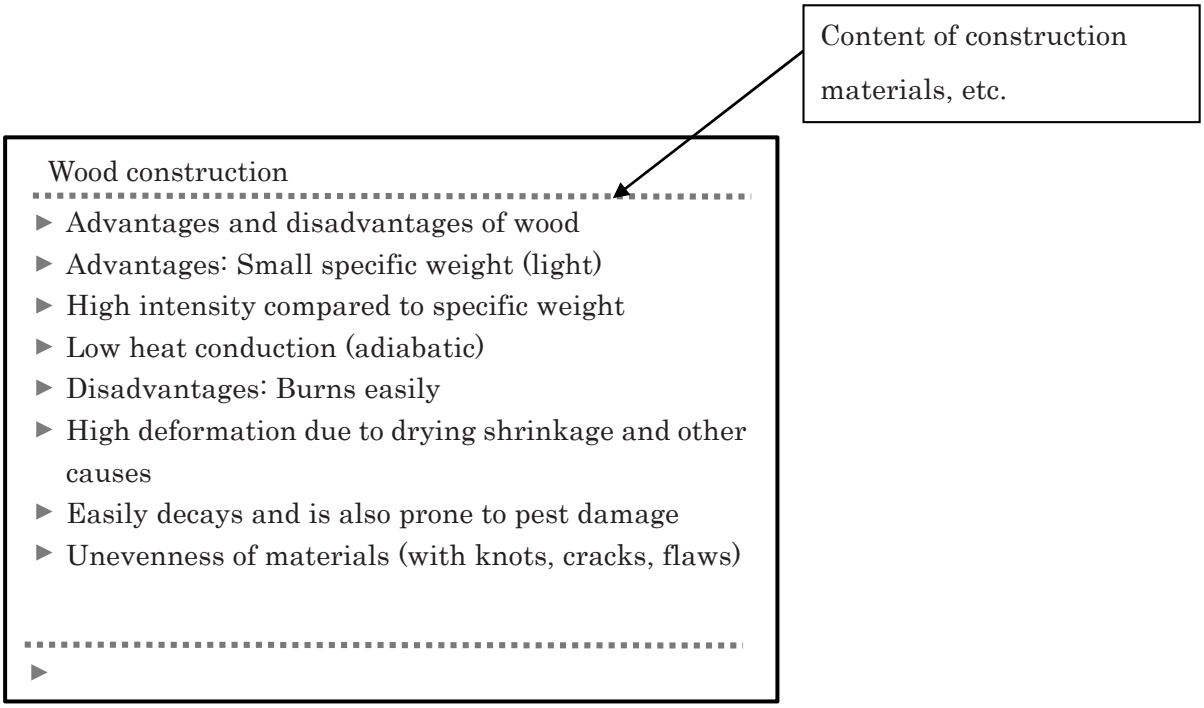
Preparation for work	1. Move out the furniture and other movable objects from the room before the work. 2. Items that can't be moved out should be covered with plastic sheets. 3. Also apply plastic sheet to the floor.
Substrate treatment	4. If the surface is not covered by wallpaper, apply substrate treatment. 5. Remove the old wallpaper. Repair any defects in the wall surface by patching putty, etc.
Selecting wallpaper	6. Cut the wallpaper.
Confirmation of preparation	7. Reconfirm any defects that can cause leaking adhesive.
Applying adhesives	8. Apply adhesive to the wallpaper.
Affixing the wallpaper	9. Affix the wallpaper. 10. Affix the wallpaper horizontally and vertically to the base line. 11. Leave margins of about 3–5 cm on top and bottom. Trace the frame edge with a metal spatula and finish the edge. 12. Affix the second piece after the first is affixed but create the space for overlap between the sheets. 13. Affix the second sheet in the same way as the first sheet, fit it to the edge, and cut off the overlapping part with a cutter knife.
Finishing	14. After cutting, wipe away any adhesive that has seeped out from the paper with a wet sponge.

(5) Examples of teaching aids

Table 3-25 is the example of teaching aids using for S2U6 "Housing refurbishment consulting" in Table 3-23. In this unit, training materials to explain raw materials are prepared because trainees need to explain material features when they provided consultation concerning housing refurbishment to customers.

Contents of teaching aids complement what is written in the textbook. It also helps to enhance trainee's understanding by defining and emphasizing what VT instructor is explaining concurrently.

Table 3-25 Example of Teaching Aids



3.8.4 Case examples of class plans

A class plan should be made based on the unit sheet. It should be made by considering the training hours allocation shown and by taking into account the introduction, development and summary. In the case of long-term practice, preparing a practice schedule table helps with grasping the training speed.

Table 3-26 Example of a Class Plan (practice schedule table)

Construction CAD/Reform Skill Division Practice Schedule Table

No	Date	Day of the week	Details	Person in charge	Unit
1	April 4	Fri	Checkup of tools, square log cutting, square log shaving	a.b	c (Structure)
2	April 7	Mon	Square log cutting, square log shaving	a.b	c (Structure)
3	April 8	Tue	How to use a saw (vertical, crosscut)	a.b	c (Structure)
4	April 9	Wed	KYT, how to use a chisel (hand-processing)	b.c	a (Law)
5	April 10	Thu	How to use plane	b.c	a (Law)
6	April 11	Fri	Drawing (foundation, pillar, lumber girder)	b.c	a (Law)
7	April 14	Mon	Joint processing (foundation, pillar, lumber girder)	a.c	b (Environment)
8	April 15	Tue	Joint processing (foundation, pillar, lumber girder)	a.c	b (Environment)
9	April 16	Wed	Joint processing (foundation, pillar, lumber girder)	a.c	b (Environment)
10	April 17	Thu	Mock house drawing (plan chart, elevation plan, floor construction plan, sectional detail drawing)	a.b	c (Planning)
11	April 18	Fri	Mock house drawing (plan chart, elevation plan, floor construction plan, sectional detail drawing)	a.b	c (Planning)
12	April 21	Mon	Demolishing mock house (to studs), demolishing entire mock house	a.b	c (Planning)
13	April 22	Tue	Demolishing mock house (to studs), demolishing entire mock house	b.c	a (Refurbishment)
14	April 23	Wed	Stud work	b.c	a (Refurbishment)
15	April 24	Thu	Stud work	b	a (Refurbishment) c (Break)
16	April 25	Fri	Stud work	b.c	A (Suggestion)

Note) For units, refer to Tables 3-22, 23.

Unit
Handling electric power tools and woodworking machinery

Person in charge

Unit
CAD

According to the system unit training method, one unit is completed in three days. Some units may be finished in two days, while some may take five days, depending on the work process. Therefore, training contents may need to be adjusted.

The person in charge of training should prepare the lesson plan at the same time as the practice schedule table.

Table 3-27 Practice Lesson Plan

Practice Lesson Plan
(Purpose of the lesson)
Learn how to use tools used on construction sites (electric power tools and woodworking machinery)
(Attainment objectives of the lesson)
Capable of handling electric power tools
Capable of handling woodworking machinery
Capable of implementing safety and health work
(Training items of the lesson)
How to use electric power tools
How to use woodworking machinery
Safety and health work
(Readiness of trainees and information on facilities, equipment and training materials)
Work space, facility, age composition of the trainees, work skill of trainees)
(Number of trainees)
For instance, 30
(Time required)
For instance, 6 hours
: :
Training
Introduction
1. ....
2. ....
3. .... (Including the content of instruction)
Development
1. ....
2. .... (Including the content of instruction)
Summary
1. Evaluation by the trainee
2. Evaluation by the instructor

Figure 3-21 Practice Work Space for Trainees (handling of tools)

In addition, works that are self-evaluated by the trainee and confirmed by the VT instructor should be included in

the lesson plan.

Table 3-28 Example of the Self-Evaluation/VT Instructor Confirmation Sheet

	Handling electric power tools and woodworking machinery	Classification number	HU105-0060-1	Self-evaluation	Confirmation by the VT instructor
	(1) Capable of handling electric power tools				
	(2) Capable of handling woodworking machinery				
	(3) Capable of implementing safety and health work				

Any format is acceptable, but the instructor is recommended to implement self-evaluation and confirmation.

Prepare a flexible class plan. It is only a plan, so it is very likely that it will need to be changed mid-course. Therefore, a process should be built to ensure that the attainment objective is met.

Chapter 4 Lesson Instruction Skills

4.1 Roles of Lessons

A lesson is a minimum unit which composes a training course. There are training courses for a few years, months, weeks, or days, and each of them is comprised of accumulated lessons. The length of one lesson can be 30 minutes to 3 hours, or even up to half a day.

A training course needs to be planed so that the trainees can achieve the attainment objective set by the training course. Each lesson has a small attainment objective which composes the attainment objective of the entire training course. For example, a slightly larger attainment objective such as “to be capable of assembling machine products” is set in one month “Machine Assembly Course”. A lesson entitled “Bolt Tightening” which is part of the “Machine Assembly Course” sets some small attainment objectives regarding bolt tightening work necessary for assembling machine products, such as “to be capable of tightening bolts without injury” and “to be capable of tightening bolts at specified torques”. (Section 3.4.1 “Setting the training plan (curriculum) for the trainees to achieve their attainment objectives” illustrates the relationships between the training course plan and the lesson plan, taking the Silviculture (Forestry) Course as an example).

Having become capable of “assembling machine products” when trainees completed the above “Machine Assembly Course” means that the attainment objective was achieved. For this to happen, the trainees must have achieved the attainment objectives of the lesson as the minimum unit comprising a training course. In above case of “Bolt Tightening”, the trainees need to have been capable of “tightening bolts without injury” and “tightening bolts at specified torques” when the lesson is over.

On the other hand, a lesson is an activity where the VT instructors conduct training for the trainees while the trainees learn from it. The purpose of lessons is to enhance the trainees’ ability. By enhancing their ability, the trainees can become able to do what they have not been able to do in the past. In other words, the trainees achieve the attainment objective of the lesson. In this wise, lessons serve as an opportunity for the trainees to enhance their ability. Therefore, an instructional program for the VT instructors and learning of the trainees need to be planned so that the trainees are able to enhance their ability to achieve the attainment objective of each lesson included in the training course.

It is easy to find out whether trainings are meaningful. It can be confirmed by conducting a certain evaluation to check whether the trainees achieved the attainment objectives at the end of training. In other words, lessons should be conducted so that all the trainees become capable to pass the evaluation.

4.2 Lesson Plans

4.2.1 Roles of lesson plans

Lessons will be planned by using the lesson plan format. Table 4-1 is the example of the lesson plan for “how to tighten hexagon bolts”.

In the lesson plan, what is the content of the lesson and how it progresses are described. Ideally, it needs to be described so that everyone who reads this lesson plan can conduct the lesson and guide the trainees to achieve the same attainment objective.

The lesson plan consists of the “Lesson Outline” and the “Lesson Procedure”. The description method of “Lesson Outline” is expounded in “4.2.2 Clarifying the purposes of lessons” and “4.2.3 Clarifying attainment objectives and training items”.

This portion should be described so that everybody who reads through the “Lesson Outline” can understand the outline of the lesson. How actual lessons are proceeded is described in “Lesson procedure”.

Table 4-1 Example of the Lesson Plan (excerpt)

<table>
<tr><th colspan="4">Lesson Outline</th></tr>
<tr><td>Lesson theme</td><td colspan="3">How to tighten hexagon bolts</td></tr>
<tr><td>Purpose of lesson</td><td colspan="3">There are many situations where bolts are tightened for a variety of purposes, such as assembly of metallic products, assembly of automobiles and machines, mounting of tire wheels, structuring of building structures, and assembling of electrical components to distribution boards. In these situations, failing to tighten bolts in a proper manner by using proper tools might damage bolts, products, and tools. Additionally, bolts could loosen over time in the future. Such a failure worsens work efficiency and increases unnecessary repair work, and will result in causing accidents at a later date. Furthermore, injuries could occur when over tightening bolts strongly or unscrewing them by swinging your arm widely and hit your hand on other parts around you.
The purpose of this lesson is in order for workers in a wide variety of trades to acquire bolt tightening skills which they need to know as common skills.</td></tr>
<tr><td>Attainment objective</td><td colspan="3">1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness.</td></tr>
<tr><td>Training items</td><td colspan="3">1. Work without causing accidents
1-1 Types and name of the tools and how to use (open ended spanner, offset wrench, socket wrench, and extension bar)
1-2 Work while preventing cause of injuries
(a) Accident types (the tools “slipping off” while in use, sudden looseness)
(b) Injury preventative measures</td></tr>
<tr><td>Eligible persons</td><td colspan="3">Workers who tighten bolts for their work
Workers who can hold tools, such as socket wrenches, with both hands</td></tr>
<tr><td>Training hours</td><td>3 hrs.</td><td>Tools used, etc.</td><td>Bolt tightening training materials (See Figure 4-10 ①-⑧)
Open ended spanner, 8x9, 10x12, and 12x14
Offset wrench, 8x9, 10x12, and 12x14, with 0°, 15°, and 45° for each
A set of socket wrenches with 9.5mm square drive, 12.7mm square drive, hexagonal/dodecagonal socket wrenches
Indicating torque tools, 10-50N/m and 20-130N/m</td></tr>
</table>

Lesson procedure			
Classification	Hrs.	Development	Remarks
Introduction Motivation	5/5	・Showing the following work, and have the trainees realize that failing to tighten bolts in a proper manner might damage tools or bolts, or could cause injuries. 1st: Tighten a bolt by using a socket wrench in the proper size. Tighten the bolt properly while noticing the following points. Direction where the hand does not hit anything. Hold the socket base (the front part of the wrench handle) and the end part of the handle ・ Explain that today's training is about this bolt tightening work. 2nd: Tighten a bolt by using a socket wrench with the long handle until wrenching off the bolt 3rd: Using a socket wrench with the short handle, show how the bolt is difficult to be unscrewed, but suddenly becomes loosened ・ Motivate the trainees by explaining the purpose as shown below: ・ The trainees will tighten bolts in various places in the future ・ Failing to tighten bolts in a proper manner could damage tools and bolts, or even cause injuries. ・ This might reduce production efficiency, resulting in dampening competitiveness. ・ To learn how to tighten bolts properly	
Presentation		・Explain the objective as follows: 1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using tools according to the assigned work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion) ・ Explain how training progresses as follows: 1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using tools according to the assigned work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion)	
"Development" Motivation	20/25	■ 1. Work without causing accidents 1-1. Types and names of the tools and how to use (open ended spanner, offset wrench, socket wrench, and extension bar). ・Motivate the trainees by giving the following explanations ・ If you do not know the name of each tool, you will get confused in the subsequent explanation . ・ The name of tool to be used today and the outline of how they are used will be explained.	

Presentation		・Explain the name of each tool and each part of the tool along with how to use as described below. However, demonstrate only how to tighten and loosen bolts. How to adjust the wrench handle position is not trained at this stage. ・ Open ended spanner, its head, and its handle Show how both ends are attached to the nut ・ Offset wrench, its head, and its handle Show how both ends are attached to the nut ・ Socket wrench, extension bar, socket, spinner handle, and ratchet handle Combine the spinner handle with the socket and show how to attach them to the nut. Show how to combine the spinner handle with the socket and the extension bar. Show how the rotation direction can be changed by operating the switching lever on the ratchet handle	
Application		・ Apply training as follows: ・ Showing some tools and each part of a tool, have the trainees answer their name. ・ Align the tools on the table. Say the name of each tool, and have the trainees pick up the one mentioned.	
Evaluation		・Observing their performance, conduct evaluation as follows: ・ Check whether each of the trainees can say the correct tool name. ・ Check whether each of the trainees can pick up the correct tool.	

4.2.2 Clarifying the purposes of lessons

If the purpose of lesson and its attainment objective have already been clarified based on research for training needs, ability analysis, target analysis and job breakdown, these would be transcribe to the lesson plan when you plan a training course.

However, the purpose of setting up a training course which has been clarified by the training needs research is too broad as a purpose of lesson. For this reason, the purpose of lesson needs to be set based on consideration of purpose of setting training course and the attainment objective of each lesson which is refined through ability analysis, target analysis and job breakdown.

The following two information items are written in the purpose of lesson.

(1) Backgrounds on implementing the lesson

(2) Capabilities of individuals who can correspond to these backgrounds

With that, the description can be organized as “The purpose of the lesson is to develop human resources who have these capabilities”. For example, the lesson plan presented in section “4.2.1 Roles of lesson plans,” the purpose of lesson is described as shown in Table 4-2.

Table 4-2 "Purpose of Lesson" as an Example of the Lesson Plan (excerpt)

Purpose of lesson	Backgrounds There are many situations where bolts are tightened for a variety of purposes, such as assembly of metallic products, assembly of automobiles and machines, mounting of tire wheels, structuring of building structures, and assembling of electrical components to distribution boards. In these situations, failing to tighten bolts in a proper manner by using proper tools might damage bolts, products, and tools. Additionally, bolts could loosen over time in the future. Such a failure worsens work efficiency and increases unnecessary repair work, and will result in causing accidents at a later date. Furthermore, injuries could occur when over tightening bolts strongly or unscrewing them by swinging your arm widely and hit your hand on other parts around you. In this lesson Corresponding ability: For workers in a wide variety of trades to acquire bolt tightening skills which they need to know as common skills is the purpose of lesson.

The purpose of the lesson described here explained that following (1) through (5) are underlied as the backgrounds for implementing this lesson

(1) There are many workplaces where bolt tightening work is required.

(2) Bolt tightening could damage bolts and tools.

(3) Bolts could be loosened.

(4) Work efficiency could be reduced.

(5) Injuries could be caused.

The corresponding capabilities are summarized as "Bolt tightening skills which they need to know as common skill", while the following tightening skills from (1) through (3) are assumed.

(1) Bolt tightening that leaves no damage to bolts and tools

(2) Bolt tightening that causes no looseness

(3) Bolt tightening that prevents causing injuries

Next, the purpose of lesson serves as "motivation" in the lesson given. "Motivation" is activity of the VT instructors to make the trainees want to receive the lessons. The instructors motivate the trainees by letting them know in what kinds of situations the contents of lessons will be used in reality. At this time, VT instructors present the backgrounds written in the purpose of the lesson to the trainees. Therefore, the specific contents/situations need to be described in the purpose of the lesson to the extent where the trainees can imagine even if they do not know about the backgrounds.

4.2.3 Clarifying attainment objectives and training items

The attainment objectives and training items of each lesson are clarified through ability analysis, target analysis, and job breakdown.

In the lesson plan presented in section "4.2.1 Roles of lesson plans", the target analysis results are reflected on the attainment objective and training items as indicated by the diagram below (Figure 4-1).

Please refer to section "3.4.2 Attainment objectives and training items". You will find the details about how to describe attainment objectives and training items.

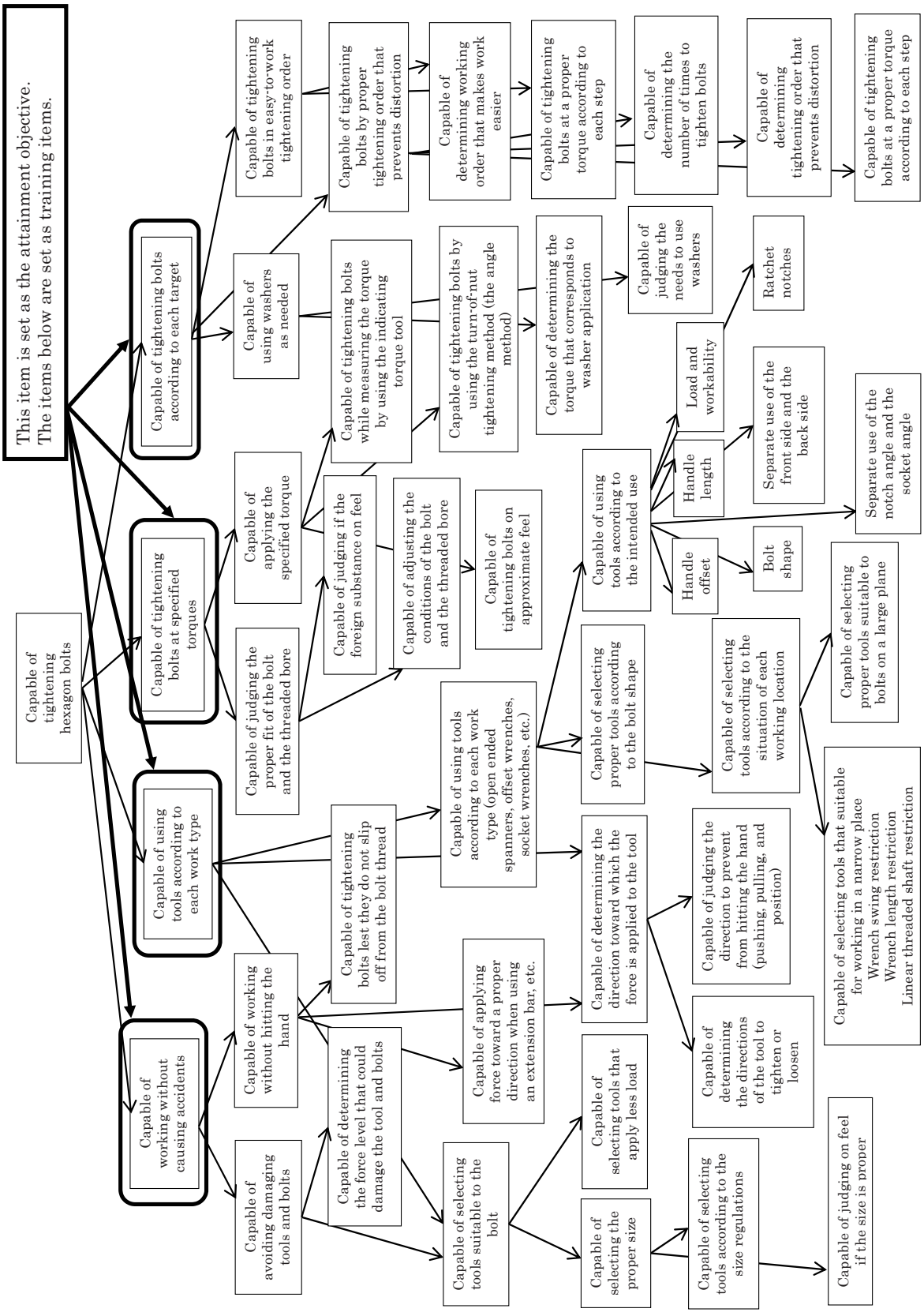


Figure 4-1 Target Analysis

4.2.4 Lesson development

This section explains the basic concept of the lesson procedure. Lessons are implemented by combining "three training stages" and "four training activities". In the portion of the lesson development of the lesson plan, the lesson procedure order based on this basic concept should be described.

(1) Three training stages

Lessons are implemented according to three training stages. These three training stages indicate each stage along a time line of the lessons. The role of each stage is described below in Table 4-3.

For example, the introduction stage takes about 5 minutes after the start of the lesson, while the next 50 minutes handles the "development" stage. The lesson is summarized and concluded in the last 5-minute section as the stage of summarization.

Table 4-3 Three Training Stages

Introduction	Stage of preparation for learning Release tension in the trainees, while attempting to attract their attention Show the whole picture of the lesson (purpose, attainment objectives, training items, and how to progress)
"Development"	Stage for instructing training items in order Implement motivation, presentation, application, and evaluation repeatedly according to each training item Implement in an easy-to-understand manner; Show each point clearly; Separate each item clearly Consider the duration of the trainee's concentration to be able to sustain. Application is effective for acquiring training items and maintaining the trainee's concentration Check the acquisition level of each trainee by conducting test, assignment, or questions
Summary	Stage of summarizing the lesson Organize training items and impress on the trainees the training items Check the matters achieved and not achieved Next lesson preview

(2) Four training activities

These four training activities indicate the variety of the activities provided by the VT instructors during the lesson in Table 4-4.

Table 4-4 Four Training Activities

Motivation	Motivate the trainees to learn Clarify what to do and what purpose it serves
Presentation	Show training items (verbally, visually, and by having them read the material) Make each item understandable and memorable (teach one training item at a time) Abstract → Specific
Application	Have the trainees use what is demonstrated (Make them be "capable of" doing assigned work) Have them get in the habit of using what is demonstrated
Evaluation	Check if the trainees have become "capable of" Observe, ask questions, and conduct test regarding what is demonstrated and applied Clarify the evaluations standards

(3) Combination with the three training stages and four training activities

Lesson development is comprised by combining three training stages and four training activities described above. The table below (Table 4-5) shows a basic pattern of lessons where three training stages and four training activities are combined. Compare this table below with section "4.4 Example of Lesson Plans", to see how this basic pattern can be applied to the actual lesson plan.

Table 4-5 Basic Lesson Pattern

	Motivation	Presentation	Application	Evaluation
Introduction	Today's theme Learning purpose			Confirmation of trainees experience
		Learning objective Training items		
		How this lesson progresses		
"Development"	■ Training item 1			
	Presentation of the actual situations			
		Presentation of methods, intuitions, and knack		
			Try until finished	
				Confirm performance
	■ Training item 2			
	Presentation of the actual situations			
		Presentation of methods, intuitions, and knack		
			Try until finished	
				Confirm performance
Summary				Check the trainee's procedure and quality
		Point check How to improve		
	Encourage to apply to the actual situations			
	Next lesson preview			

In the above table, motivation, presentation, application, and evaluation are combined for each training item. Multiple training items could also be combined and demonstrated (presented) at once; however, VT instructors need to take into consideration how much the trainees can understand and memorize what they learn. Even the VT instructor try to make trainees to apply for what they have learned after long demonstration of many training items, trainees may have already forgotten what was demonstrated (presented) earlier. Considering such a point, therefore, the VT instructors need to determine the amount of training items that can be demonstrated (presented) at once during the lesson (like training item1 & 2 in Table 4-5).

"Motivation" is activity that makes the trainees want to learn. The feeling of the trainees to learn varies depending on their desire to learn the lesson. This motivating activity does not need to be repeated if trainees are highly motivated with a strong desire to learn. On the other hand, for example, where the rate of students that go on to the next stage of education is high compared to the entire population, not all the trainees participate in the training with a clear will to learn. If this

is the case, the trainees might need to be motivated repeatedly. It should be noted that the trainees tend to be more highly motivated when the training lessons incorporate many activities such as “Application”, where the trainees do the work by themselves.

The target of each lesson is to become “capable of …ing”. If they want to become “capable of” doing something, they have to try to do that by themselves at least once. This is called “Application”. Therefore, “Application” must be set even in lectures where you teach knowledge items such as theoretical subjects.

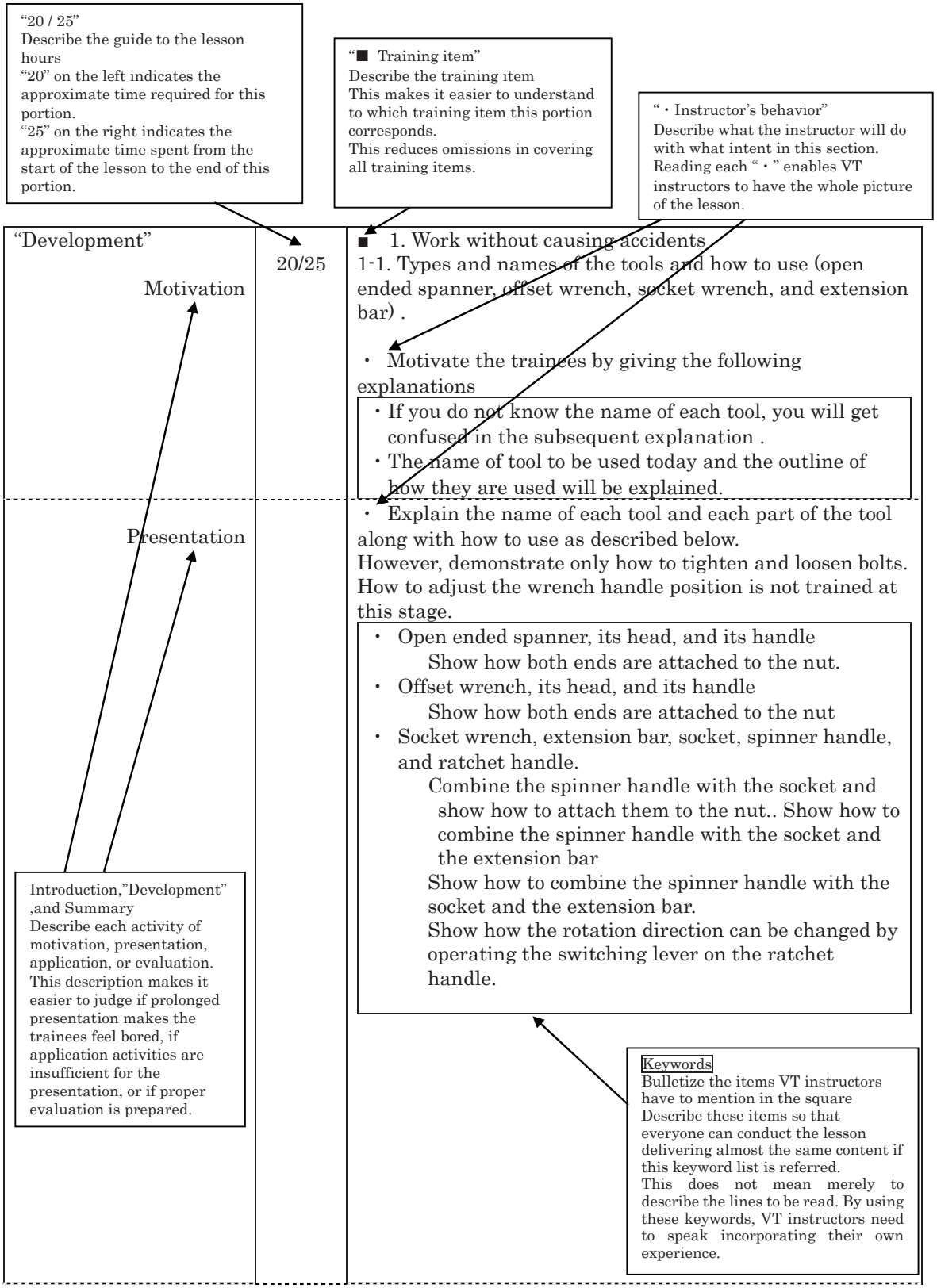
Additionally, “Presentation” is a stage where the VT instructors give “training”. Hopefully, during this activity, all the trainees are expected to learn. However there may be a case where some trainees could neglect their learning by failing to concentrate on the presentation by the VT instructors. In the contrast, “Application” is a stage where the trainees themselves do the work by themselves and it can be said that they are learning for certain. If the trainees do not learn by themselves, no matter how the VT instructors try to train them, the capabilities of the trainees do not reach to the attainment objectives. For this reason, it is essential to incorporate “Application” into each lesson on a timely basis.

“Evaluation” is a stage where the VT instructors confirm whether each trainee has acquired each training item and has achieved the attainment objectives for the lessons. The VT instructors evaluate and confirm whether each trainee has achieved the attainment objects by observing them during “Application” and by conducting proper test.

(4) How to describe the “development” columns

The section below shows how to describe the “development” columns.

Table 4-6 How to Describe the "Development" Columns



4.3 Instruction Methods Corresponding to Training Items

Within the lesson, the stage of “Presentation” → “Application” serves as the main framework of each lesson where the trainees learn training items. There are some types of training items. Depending on the type, the training method for trainees to acquire ability easily should be selected. This method is combined with “Presentation” and “Application”. This section classifies training items into knowledge, sensory-motor skills, intellectual management skill, and attitude in order to expound each basic training method.

(1) Instruction of knowledge

①Repeated learning

Repeated learning is a learning method to memorize a certain fact by reading and writing it repeatedly. This method is used for learning merely to memorize the fact, which is more effective for learning to regenerate and recognize a certain amount of knowledge for exams. Knowledge which was memorized is generally forgotten at a certain rate. Re-learning of knowledge before it is forgotten can entrench the knowledge learned. For example, when memorizing 100 facts, suppose that you have finished learning 1 through 10 facts and then you learn 1 to 20 facts instead of going and learning 11 through 20 facts. This means that you have reviewed 1 through 10 facts before forgetting them.

However, humans forget what they learned in due course anyway unless they have opportunities to use the knowledge gained. This kind of learning method can be effective for an impending exams where the trainees are required to check their knowledge memorized within a specified period. However, this is not effective learning for the purpose of applying the knowledge gained to the actual situations in the real world.

②Presentation of systematization and structuring

Knowledge can be unforgettable when memorized not as a random enumeration but as a system or a structure.

The example below, “How to explain 1”, explains knowledge as a random enumeration, which is difficult to memorize.

> How to explain 1:
> N-2F is manual welding which is conducted downward for average-thick steel plates without backboards.
> A-1V is manual welding which is conducted vertically for thin plates with backboards.

The other example below, “How to explain 2”, explains as the structured knowledge, which is easy to memorize.

> How to explain 2:
> Welding types are indicated according to the following protocols.
>
> N-2F
> - Plate direction F: Downward; V: Vertical; H: Horizontal
> - Plate thickness 1: Thin; 2: Average; 3: Thick
> - Welding types N: Manual welding (without backboards); A: Manual welding (with backboards)
>
> N-2F indicates manual welding (without backboards) for average-thick plates and downward.
> A-1V indicates manual welding (with backboards) for thin plates and vertical.

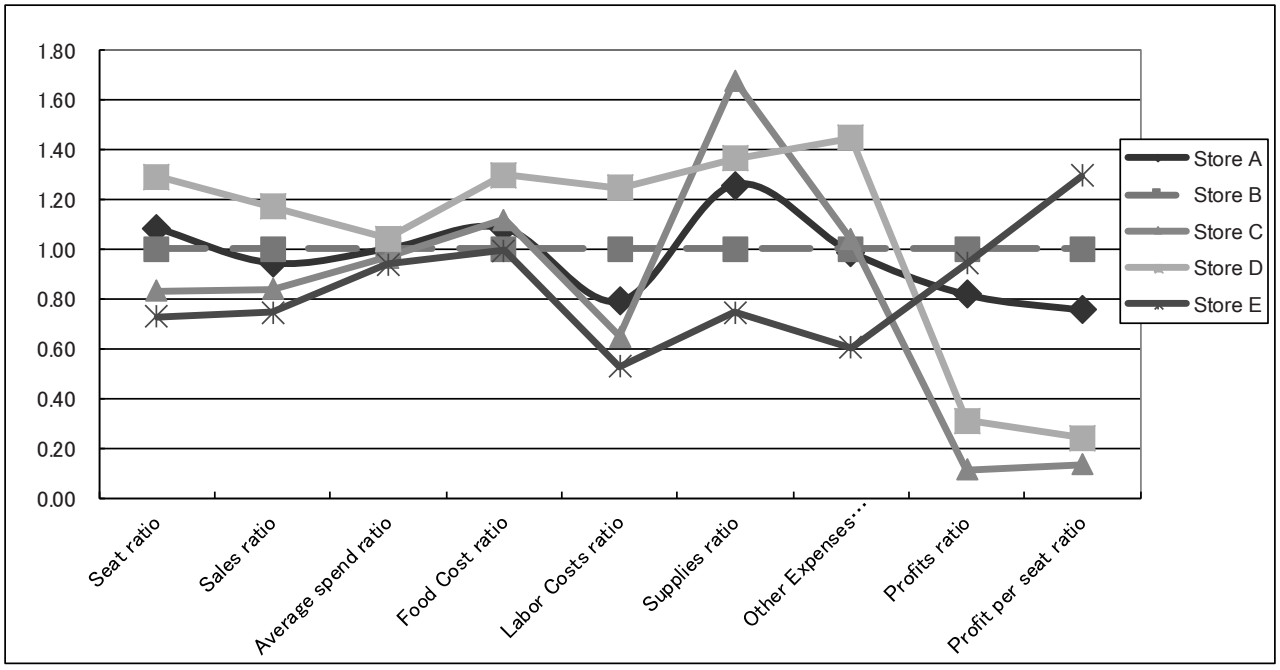
By memorizing the systems and structures, individual facts can be estimated or derived from the systems without memorizing such facts. This method can deal with a wide variety of situations. This means, even you have to deal with many situations, you only have to memorize a fewer number of facts.

③ Learning combined knowledge and situations to be applied

Table 4-7 Sales Chart for Each Store

	No. Seats	Sales	Average spend	Food Cost	Labor Costs	Supplies	Other Expenses	Profits	Profits per Seat
Store A	52	14,035,890	2,499	4,351,126	3,649,331	1,122,871	3,087,896	1,824,666	35,090
Store B	48	14,878,040	2,496	4,017,071	4,612,192	892,682	3,124,388	2,231,707	46,494
Store C	40	12,491,940	2,410	4,497,098	2,998,066	1,499,033	3,247,904	249,839	6,246
Store D	62	17,404,500	2,599	5,221,350	5,743,485	1,218,315	4,525,170	696,180	11,229
Store E	35	11,088,350	2,347	3,991,806	2,439,437	665,301	1,885,020	2,106,786	60,194

	Seat ratio	Sales ratio	Average spend ratio	Food Cost ratio	Labor Costs ratio	Supplies ratio	Other Expenses ratio	Profits ratio	Profit per seat ratio
Store A	1.08	0.94	1.00	1.08	0.79	1.26	0.99	0.82	0.75
Store B	1	1	1	1	1	1	1	1	1
Store C	0.83	0.84	0.97	1.12	0.65	1.68	1.04	0.11	0.13
Store D	1.29	1.17	1.04	1.30	1.25	1.36	1.45	0.31	0.24
Store E	0.73	0.75	0.94	0.99	0.53	0.75	0.60	0.94	1.29



The above chart (Table 4-7) was created by using spreadsheet software. It is hard to memorize each function of the spreadsheet software, such as “how to add a border”, “how to calculate cells”, and “how to make a graphic chart”. Through learning each function one by one using the reference manual; Learning about adding a border or calculating cells in a process to solve the actual problems, such as calculating the average customer spending and profit rates, it is possible to memorize knowledge more robustly. This is associated with the acquisition of intellectual management skills, which will be explained in detail later.

(2) Instruction of sensory-motor skills

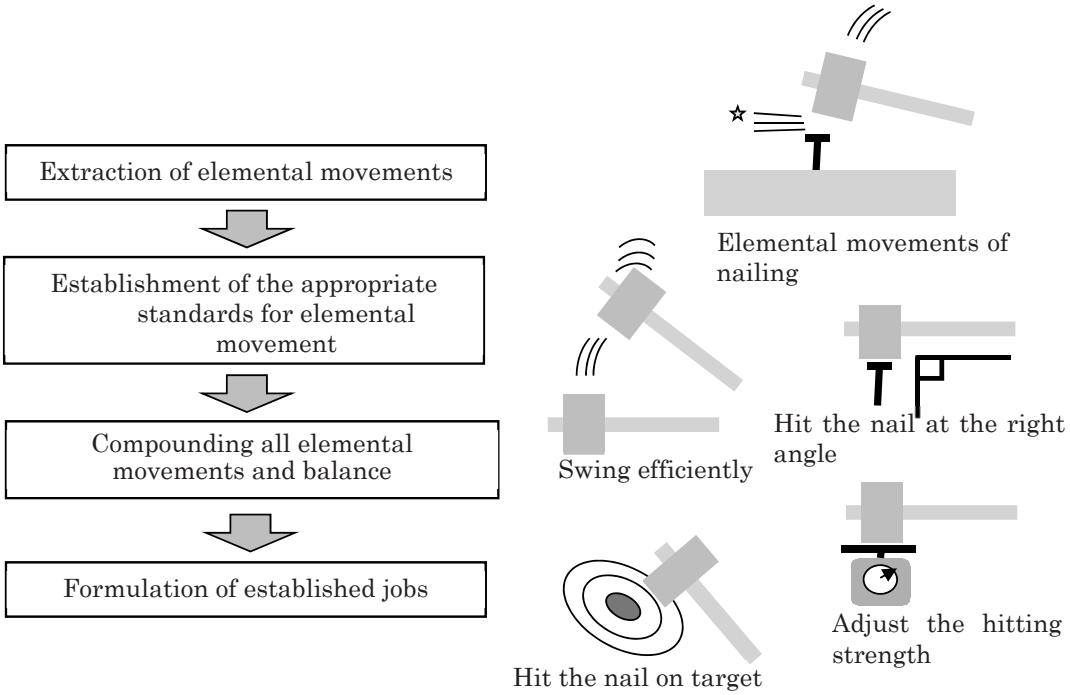


Figure 4-2 Instruction of Sensory-Motor Skills

(Source: Figure 2-28 Knack for instruction of sensory-motor skills on P. 107 of the 10th revised edition of "Theory and Practice of Vocational Training" edited by General Incorporated Foundation, the Vocational Training Materials Research Center)

Regardless of whether conscious or unconscious, sensory-motor skills is the skill which largely involves element to control body movements by sense. Jobs such as nailing where the hammer needs to hit the nail accurately require various control factors when the hammer is swung.

When training such sensory-motor skills, VT instructors need to clarify elemental movements existing within the relevant job, and then attempt to have the trainees practice each single elemental movement one by one. VT Instructors need to have the trainees practice each single elemental movement first, followed by practicing several elemental movements. By doing so, the trainees becomes able to carry out the entire job.

Table 4-8 Example of Nailing Work Instruction

	Learning items	Training method
Extraction of elemental movements + Establishment of the appropriate standard for elemental movements	Hit the nail on target	・Practice adjusting the body position so that the hammer can hit the nail on target.
	↓	
	Hit the nail at the right angle	・Practice adjusting the knee height and the width between feet placed so that the hammer can hit the nail at the right angle.
	↓	
	Swing efficiently	・Practice swinging the hammer using the wrist and elbow as the axis of rotation. ・The purpose is not hit on target. Practice by using a target without using nails.
↓		
Combining all elemental movements and balance + Formulation of established jobs	Swing efficiently + On target	・Practice to be capable of both swinging the hammer using the wrist and elbow as the axis of rotation + taking aim. Practice by using a target without using nails.
	↓	
	Swing efficiently + On target + At a right angle	・Practice so that the following skills co-exist: swing the hammer using the wrist and elbow as the axis of rotation + take aim + hit the nail at the right angle. Start practicing by using nails.

(3) Instruction of intellectual management skills

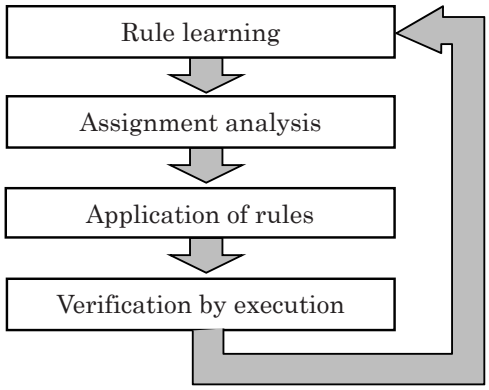


Figure 4-3 Instruction of Intellectual Management Skills

(Source: Figure 2-30 Knack for instruction of intellectual management skills on P. 108 of the 10th revised edition of "Theory and Practice of Vocational Training" edited by General Incorporated Foundation, the Vocational Training Materials Research Center)

An intellectual management skill is the skill to apply knowledge to the actual situations in the real world. First, the trainees need to learn the knowledge, and then they practice how to apply this knowledge to the situations in the real world.

Prepare assignments for the trainees that can be solved with less knowledge in the beginning, then VT instructors have them learn the knowledge which is required to work on the assignments given, and let them start to work on the assignments. Next, VT instructors may provide the trainees with complicated assignments which require more knowledge. By doing so, knowledge which can be applied to the actual situations is gradually increased.

When knowledge is applied to the assignments, as graphically illustrated in Figure 4-4, it is important to let the trainees themselves examine what they learn (See section "4.5 Design of Training Assignments"). If the VT instructor simply shows the procedure on how to work on this assignment, it would not be an effective method for learning of intellectual management for the trainees.

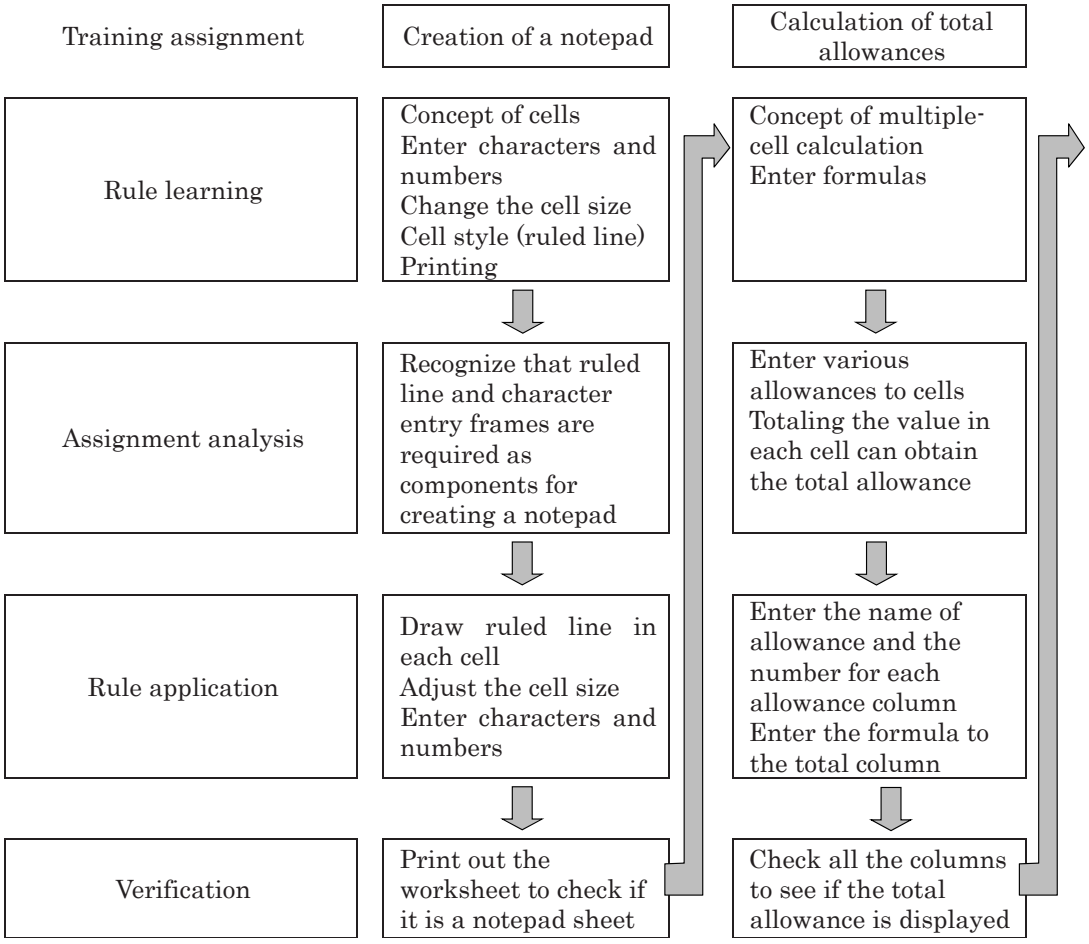


Figure 4-4 Example of Spreadsheet Software Learning

(Source: Figure 2-31 Example of spreadsheet software learning on P. 109 of the 10th revised edition of "Theory and Practice of Vocational Training" edited by General Incorporated Foundation, the Vocational Training Materials Research Center)

(4) Instruction of attitude

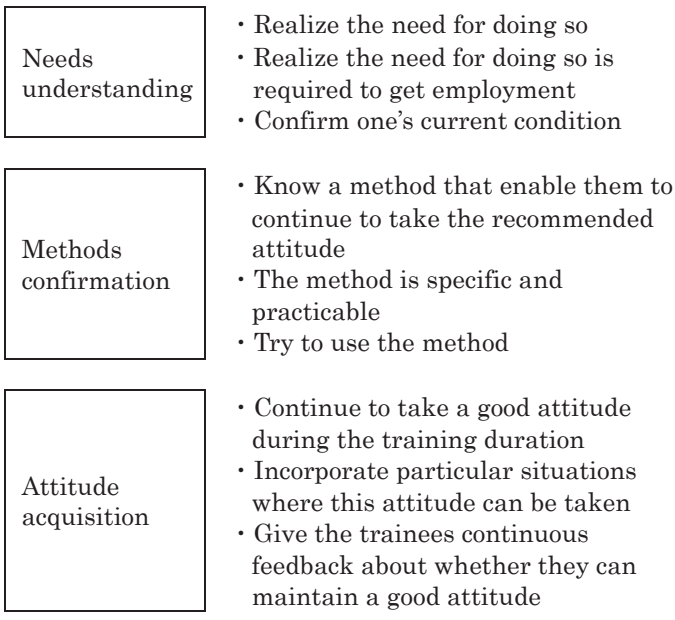


Figure 4-5 Three Stages of Attitude Instruction

(Source: Figure 2-38 Three stages of attitude instruction on P. 123 of the 10th revised edition of "Theory and Practice of Vocational Training" edited by General Incorporated Foundation, the Vocational Training Materials Research Center)

Attitude is one's own tendency of behavior where he/she can select the method and result of a certain action taken. For example, as for going to school, there are individuals who try to arrive at school on time while some do not care if they arrive late. This example shows that both parties have different attitudes about the behavior of going to school. Instruction of attitude mentioned here will change such undesirable attitudes to favorable attitudes through instructions.

This instruction of attitude is implemented in three stages. The first stage is the stage where the instructors try to persuade and make them understand why fine attitude should be taken. In this stage, the trainees have to clear up all questions regarding taking the relevant attitude. The second stage trains the trainees how to take the relevant attitude. Explain the trainees specific methods by which they can take the required attitude so long as they actually work in this trained method. Until here, these instructions are conducted through lectures and practices. The third stage is to confirm whether the trainees are able to continuously take the required attitude. If the trainees fail to take the required attitude, the VT instructor tells them what they observed and encourages them to take the recommended attitude.

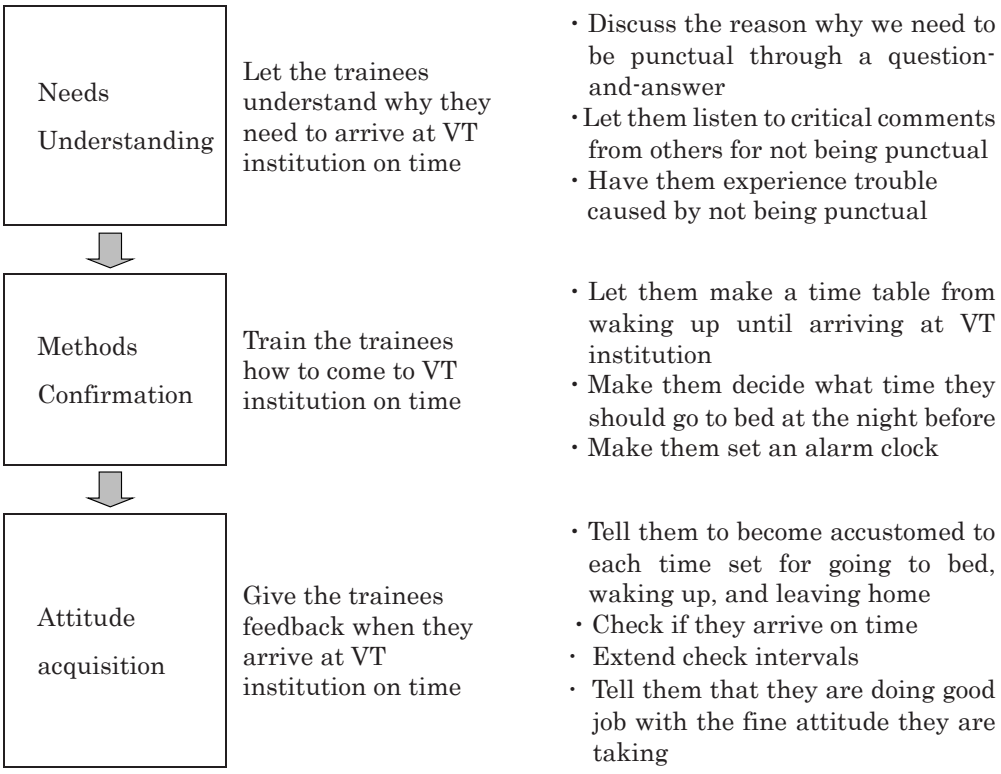


Figure 4-6 Example of Instruction for Trainees That Arrive Late for Lesson

4.4 Example of Lesson Plans

This section graphically illustrates the lesson plan which is described based on the basics of lesson planning and instructional tips that have been described up until here.

Table 4-9 Example of the Lesson Plan

Lesson Outline	
Lesson theme	How to tighten hexagon bolts
Purpose of Lesson	There are many situations where bolts are tightened for a variety of purposes, such as assembly of metallic products, assembly of automobiles and machines, mounting of tire wheels, structuring of building structures, and assembling of electrical components to distribution boards. In these situations, failing to tighten bolts in a proper manner by using proper tools might damage bolts, products, and tools. Additionally, bolts could loosen over time in the future. Such a failure worsens work efficiency and increases unnecessary repair work, and will result in causing accidents at a later date. Furthermore, injuries could occur when over tightening bolts strongly or unscrewing them by swinging your arm widely and hit your hand on other parts around you. The purpose of this lesson is in order for workers in a wide variety of trades to acquire bolt tightening skills which they need to know as common skills.
Attainment objective	1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using tools according to the assigned work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion)
Training items	1. Work without causing accidents 1-1. Types and name of tools and how to use (open ended spanner, offset wrench, socket wrench, and extension bar) 1-2. Work while preventing the cause of injuries (a) Accident types (the tool “slipping off” while in use, sudden looseness) (b) Injury prevention measures 1-3. Work that prevents damage to bolts and tools (a) Damage types (damaging bolt threads or spread/broken wrench end); (b) Bolt/tool size (the two-face width, metric bolts, and unified bolts); (c) Thread bore fitting to the bolt size, and the feel of the tools; (d) Methods that prevent damage 2. Use of tools suitable for the assigned work 2-1. Work types (bolt locations (flat or narrow), bolt accessories (brake hoses or plugs), and torque scale) 2-2. How to use tools (open ended spanner, offset wrench, socket wrench, extension bar, ratchet handle, and adjustable wrench) (a) Direction toward which force is applied; (b) Offset; (c) Handle length; (d) Bolt shape; (e) Load and workability; (f) Adjustment of the holding position (front and back sides, notch/socket angles, ratchet) 2-3. Selection of proper tools suitable for the assigned work 3. Tightening to the proper torque 3-1. Concept of torque 3-2. How to use indicating torque tools and the turn of nut tightening method (angele method) 3-3. A feel for the reference torque (10, 30, 60, and 100N/m) 3-4. Fit of the bolt and the threaded bore (a) A feel for foreign substance (b) How to clean the threaded portion 4. Tightening bolts according to each object 4-1. Use of washers (a) Purpose of washers; (b) Locations where washers are used; (c) How to apply torque to the washer 4-2. Easy-to-work order (a) Temporary tightening that makes work easier; (b) From temporary tightening to full tightening 4-3. Tightening order that does not distort the product (a) Inside → Outside; (b) Diagonal; (c) Multiple tightening (evenly)
Eligible persons	Workers who tighten bolts for their work Workers who can hold tools, such as socket wrenches, with both hands

Training hours	3 hrs.	Tools used, etc.	Bolt tightening training materials (See Figure 4-10 ①-⑧) Open ended spanner, 8x9, 10x12, and 12x14 Offset wrench, 8x9, 10x12, and 12x14, with 0°, 15°, and 45° for each A set of socket wrenches with 9.5mm square drive,12.7mm square drive, hexagonal/dodecagonal socket wrenches, 12.7mm square drive hexagonal/ dodecagonal socket wrenches Indicating torque tools, 10-50N/m and 20-130N/m

Lesson procedure			
Classification	Hrs.	Development	Remarks
Introduction Motivation	5/5	・Showing the following work, and have the trainees realize that failing to tighten bolts in a proper manner might damage tools or bolts, or could cause injuries. 1st: Tighten a bolt by using a socket wrench in the proper size. Tighten the bolt properly while noticing the following points. Direction where the hand does not hit anything: Hold the socket base (the front part of the wrench handle) and the end part of the handle ・Explain that today's training is about this bolt tightening work. 2nd: Tighten a bolt by using a socket wrench with the long handle until wrenching off the bolt 3rd: Using a socket wrench with the short handle, show how the bolt is difficult to be unscrewed, but suddenly becomes loosened ・Motivate the trainees by explaining the purpose as shown below: ・The trainees will tighten bolts in various places in the future ・Failing to tighten bolts in a proper manner could damage tools and bolts, or even cause injuries. ・This might reduce production efficiency, resulting in dampening competitiveness. ・To learn how to tighten bolts properly	
Presentation		・Explain the objective as follows: 1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using tools according to the assigned work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion) ・Explain how training progresses as follows: 1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using tools according to the assigned work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion)	
"Development" Motivation	20/25	■ 1. Work without causing accidents 1-1. Types and names of the tools and how to use (open ended spanner, offset wrench, socket wrench, and extension bar). ・Motivate the trainees by giving the following explanations ・If you do not know the name of each tool, you will get confused in the subsequent explanation . ・The name of tool to be used today and the outline of how they are used will be explained.	

Presentation		・Explain the name of each tool and each part of the tool along with how to use as described below. However, demonstrate only how to tighten and loosen bolts. How to adjust the wrench handle position is not trained at this stage. ・Open ended spanner, its head, and its handle Show how both ends are attached to the nut ・Offset wrench, its head, and its handle Show how both ends are attached to the nut ・Socket wrench, extension bar, socket, spinner handle, and ratchet handle Combine the spinner handle with the socket and show how to attach them to the nut. Show how to combine the spinner handle with the socket and the extension bar. Show how the rotation direction can be changed by operating the switching lever on the ratchet handle.	
Application		・Apply training as follows: ・Showing some tools and each part of a tool, have the trainees answer their name. ・Align the tools on the table. Say the name of each tool, and have the trainees pick up the one mentioned.	
Evaluation		・Observing their performance, conduct evaluation as follows: ・Check whether each of the trainees can say the correct tool name. ・Check whether each of the trainees can pick up the correct tool.	
“Development” Motivation		■ 1. Work without causing accidents 1-2. Work while preventing injuries a) Accident types (the tools “slipping off” while in use, sudden looseness) b) Injury prevention measures ・Motivate the trainees by demonstrating the situations where accidents could be caused as follows: ・Attach a largely-offset wrench to the bolt, apply force toward a proper direction to the extent that the bolt does not loosen. ・Show that the offset wrench can slip off from the bolt by changing the force direction slightly upward ・Summarize this portion with the following words: ・When the tool slips off while the force is being applied, you might be injured by hitting your hand on surroundings. . ・Need to learn how to prevent this from occurring.	
Presentation		・Explain the accident types as follows: ・There are broadly two bolt-tightening accident types 1. The tightening tool slips off from the bolt (The tool slips off due to different force direction or large offset) 2. The bolt suddenly loosens	
Presentation		・By using an open ended spanner, explain how to prevent accidents from occurring when tightening bolts. ・Tools with proper handle lengths ・In principle, apply force toward the front (toward the trainee’s body front). ・Check for objects that could cause injuries in the direction toward which the open ended spanner’s handle moves. ・When the handle turns, the angle is heading for the obstacle. ・The handle might be pushed by the hand palm without holding the handle where there is a certain obstacle. Introduce the handle turning method that does not cause injuries although the tool suddenly slips off. ・Match the direction to which force is applied in the bolt tightening/ loosening direction.	

Application		・Give the trainees the following training assignments to practice for safety use of the open ended spanner. Training assignment 1-1. Fixing the plate on the base (1) Fix both edges of the plate with six bolts by using an open ended spanner, and then remove them. Let them notice the following points. ・Pull the spanner toward the body front. ・When the trainee turns the wrench toward the obstacle, tell them to push the wrench without holding the handle. ・At that time, have them hold the wrench head. ・Make them confirm to apply force in the bolt tightening/loosening direction.	Training materials ①,③,⑤, and ⑥
Evaluation		・Evaluate the trainee's performance condition from the following viewpoints: ・The trainee pulls the wrench toward the body front ・When the trainee turns the wrench toward the obstacle, the trainee pushes the wrench by their palm without holding the handle. ・The trainee applies force in the direction toward which the bolt is turned.	
Presentation		・By using an offset wrench, explain how to prevent accidents from occurring when tightening bolts. ・Offset wrenches have various offsets. ・The conditions to match with the bolt turning direction become very strict.	
Application		・Give the trainees the following training assignments to practice safety use of the offset wrench. ・Training assignment 1-2. Fixing the plate on the base (2) ・Let them use long offset wrenches of 0°, 15°, and 45°. ・Let them check the direction toward which force is applied. ・Let them experience the situation where the tool easily slips off when the direction is changed slightly. ・Tell them to continuously pay attention to the force direction.	Training materials ①,③,⑤, and ⑥
Evaluation		・Evaluate the trainee's performance condition from the following viewpoints: ・The force direction is matched with each offset angle of the offset wrench.	
Summary Presentation		Today's training contains the following items: ・Safety work methods ・Proper selection of tools ・Applying proper torque ・Proper procedure of tightening bolts to fix products in various shapes and proper use of washers ・Tell them that you have confirmed that all the trainees have achieved the following attainment objectives through training assignments worked on. 1. Capable of working on bolts and nuts without injuries, without damaging bolts, threaded bores, or tools, and without causing looseness 2. Capable of using proper tools according to the work 3. Capable of tightening bolts at specified torques 4. Capable of tightening bolts according to each object (washers, workability, and distortion)	

Motivation		Summarize today's lesson so that the trainees apply what they learned to the actual work as follows: ・The trainees can adapt to bolt tightening work done in various places from now on ・The trainees can use tools properly without causing injuries or damaging tools and bolts. ・The trainees can enhance production efficiency as part of maintaining competitiveness. ・The trainees have to utilized what they learned today during their actual work.	

4.5 Design of Training Assignments

4.5.1 Importance of designing training assignments

Training assignments should be designed strategically. The main target of VT is trade skills. It is impossible for the trainees to acquire trade skills merely by attending lectures or observing performance by the VT instructors. The trainees can acquire trade skills only by experience from accumulating practice of the skills. This is the ultimate reason why more than half of the VT curriculum is devoted to practice training. As shown in the figure below (Figure 4-7), practice means to carry out the training assignments given by the VT instructors, which serves as "learning through action". Additionally, this "learning through action" based on the idea of training assignments actually forms the core of VT.

In most cases, training assignments are designed as a group of highly-related assignments. This is because the targeted ability of training assignments is the integral and practical ability. Designing a group of assignments (assignments A, B, C...) is equal to programming "learning through action". Therefore, it is not an exaggeration to say that these training assignments reflect the competence and educational consideration of the VT instructors. The VT instructors have to design training assignments strategically in order for the trainees to achieve the attainment objectives completely and rationally.

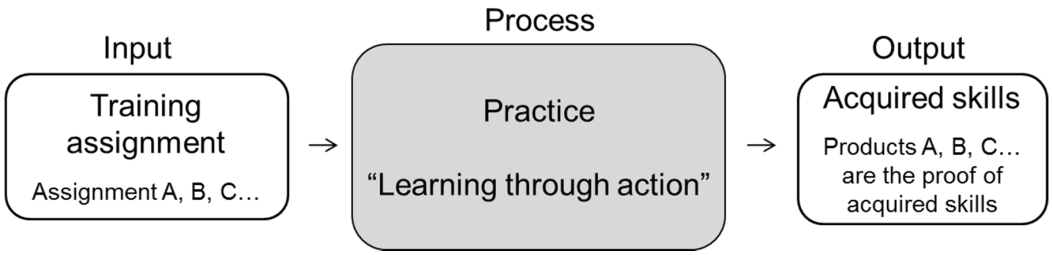


Figure 4-7 Relationship Between Training Assignments and Practices in VT

4.5.2 Design processes for training assignments

Training assignments that are rationally designed within the scope of a certain process help the trainees acquire trade skills smoothly. This section explains the design processes for training assignments by dividing them into three steps. Figure 4-8 shows these three steps on a conceptual basis.

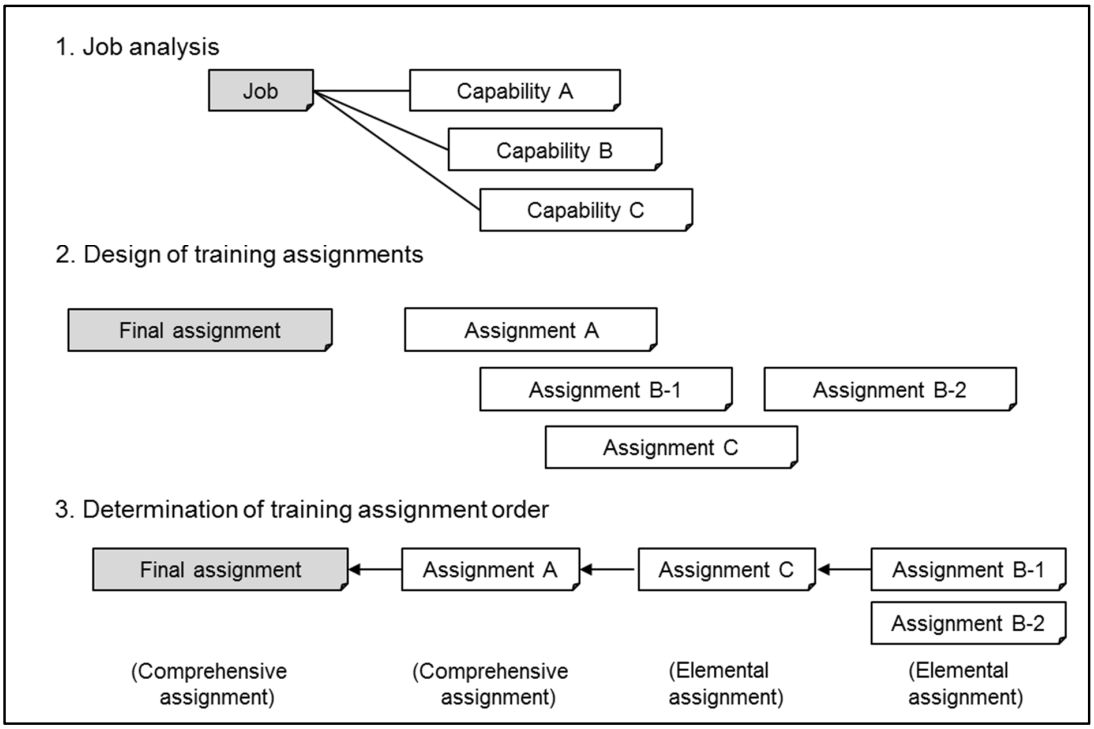


Figure 4-8 Design Process for Training Assignments

(1) Job analysis

Analyze the targeted job (ability) and break it down into ability components (skills and attitude) that compose the job. Figure 4-9 shows an example of job analysis based on target analysis.

(2) Design of training assignments

Training assignments are designed in steps according to the characteristics of each ability that is a component of the job. Training assignments are “assignments for learning through action”. The VT instructors need to have an image of the learning behavior of the trainees when designing training assignments. Furthermore, they make effort so that the trainees can feel the importance and enjoyment of the training content. The final assignment shown in Figure 4-11 corresponds to the practical test which is a typical example of a comprehensive training assignment.

(3) Determination of training assignment order

Presenting order of training assignments has to be determined so that training assignments are given step by step from elemental to comprehensive assignments based on consideration of the difficult level of each assignment and required skills.

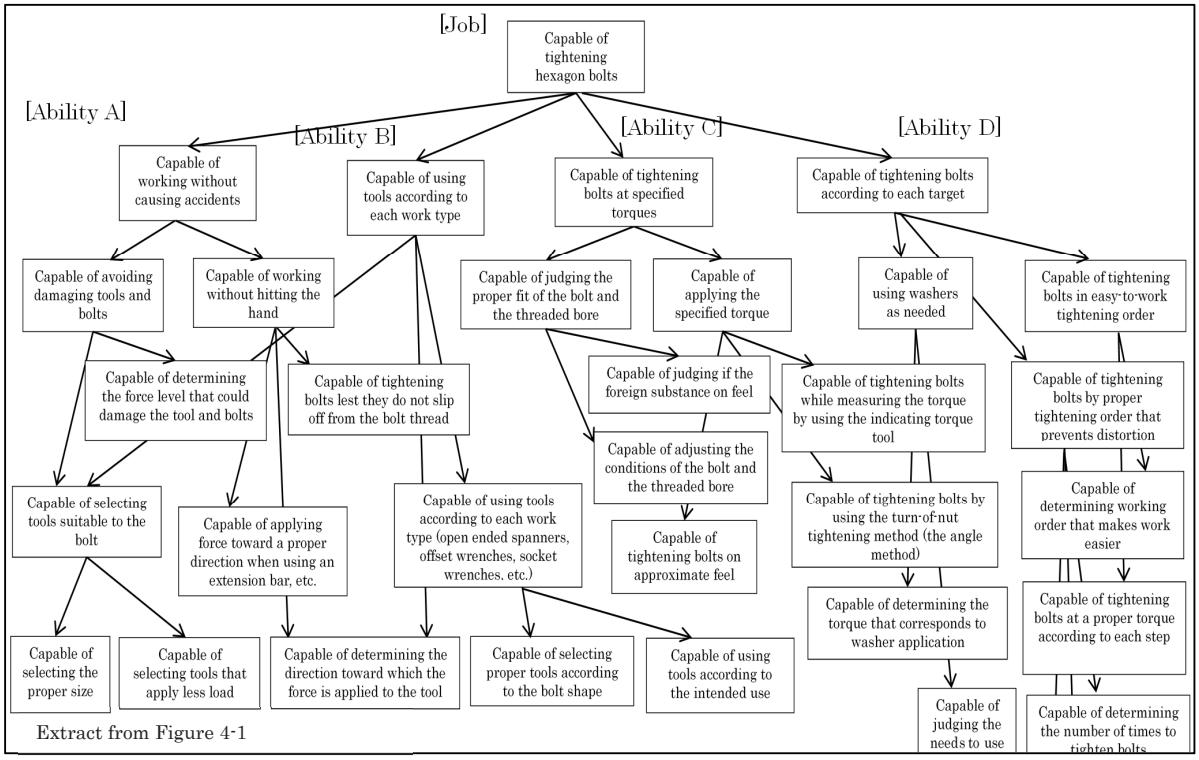


Figure 4-9 Example of Job Analysis with the Use of Target Analysis

4.5.3 Example of training assignments design

As a case study, this section introduces “tightening by using hexagon bolts”. Table 4-10 shows the outline of this training. Tightening bolts appears to be a simple job to do. However, failing to tighten bolts in a proper manner could damage bolts and threaded bores. Bolt looseness could cause disasters or accidents. Moreover, if a tightening tool slips off from a bolt while applying large force on a tool handle, the operator could be injured by hitting his/her hand against another object or by falling down. Figure 4-10 shows an example of training materials and tools used during training for the tightening hexagon bolts according to this plan’s outline. Figure 4-11 shows an example of the final assignment which is given in the final stage of this training. This final assignment can be implemented by combining the training materials and the tools shown by Figure 4-10. Figure 4-12 shows a design flow for the training assignment for the tightening hexagon bolts. In the flow of this figure, job analysis on tightening hexagon bolts is conducted at the beginning and extract the abilities that compose the relevant job. Next, this flow shows training assignments A through D which were considered for the purpose of developing each ability. The numbers from ① to ⑧ as written remarks under each training assignment are the number of training material and the tool shown in Figure 4-10. Finally, this flow shows the order of training assignments

which was determined based on consideration for the difficulty level of each training assignment and required skills.

Table 4-10 Training Outline of "Tightening Hexagon Bolts"

Target	Tightening hexagon bolts
Purpose of lesson	[Purpose] The purpose of this lesson is in order for workers in a wide variety of trades to acquire bolt tightening skills which they need to know as common skill. [Importance] Tightening bolts appears to be a simple job to do. However, failing to tighten bolts in a proper manner could cause the following problems. (1) Bolts, products, or tools are damaged. (2) Bolts are loosened. (3) When the tightening tool slips off from the bolt while applying large force on the tool handle, the operator could be injured by hitting his/her hand against another object or by falling down. [Application] This skill is applied to the following trades: Assembly of metallic products, assembly of automobiles, structuring building structures, and assembly of distribution boards.
Attainment objectives	A. Capable of working without causing accidents (injuries) and damage (to bolts, threaded bores, and tools) B. Capable of using tools suitable for the working conditions C. Capable of tightening bolts at a proper torque D. Capable of tightening bolts according to the materials and forms of the targeted object to be tightened (Use of washers, distortion prevention for the targeted object, consideration on workability, etc.)
Eligible persons	Trainees of Metallic Processing, Machining, Automobile Maintenance, Electrical Engineering, and Architecture
Training hours	xx hours

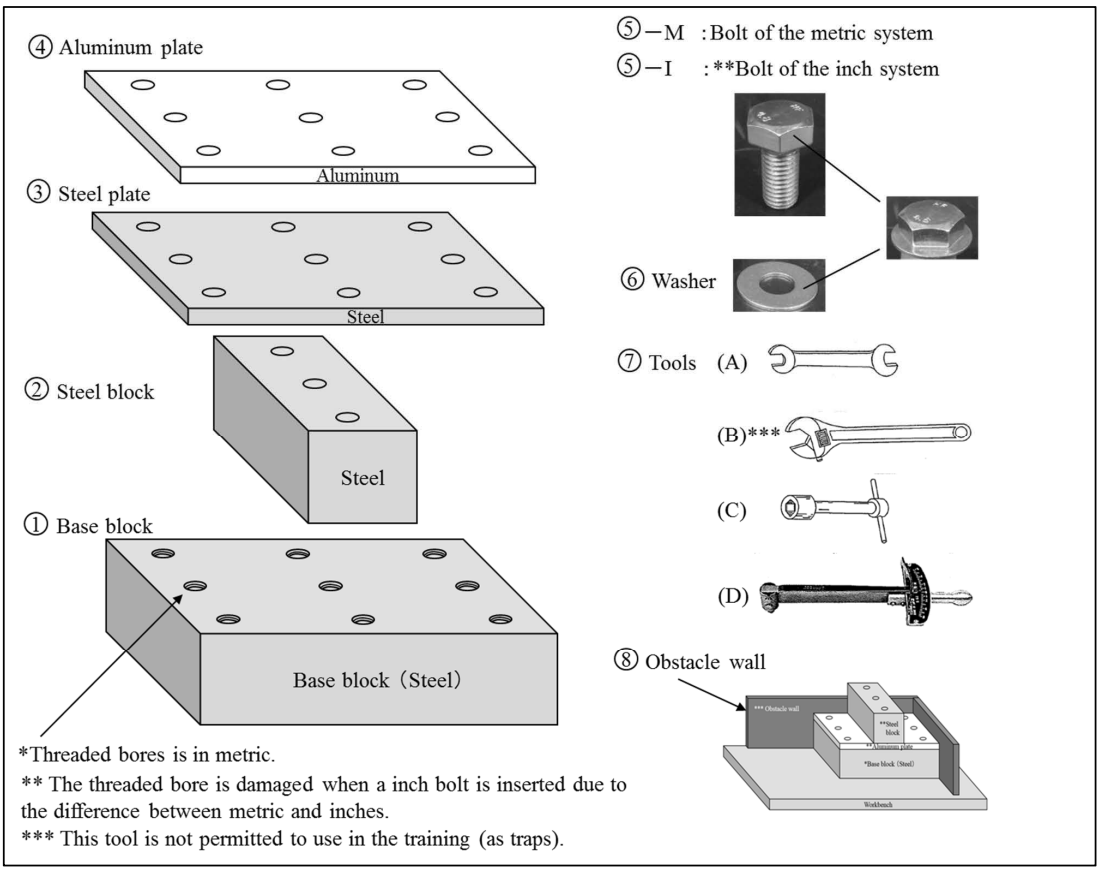


Figure 4-10 Example of Materials and Tools Used for Training of Tightening Hexagon Bolts

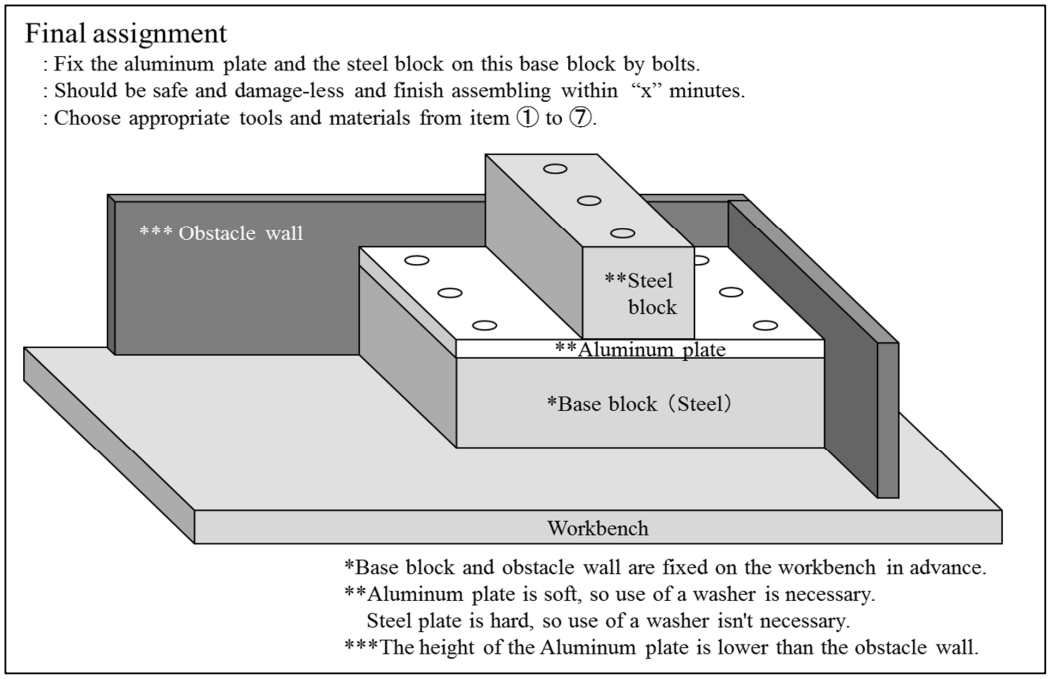


Figure 4-11 Example of the Final Training Assignment

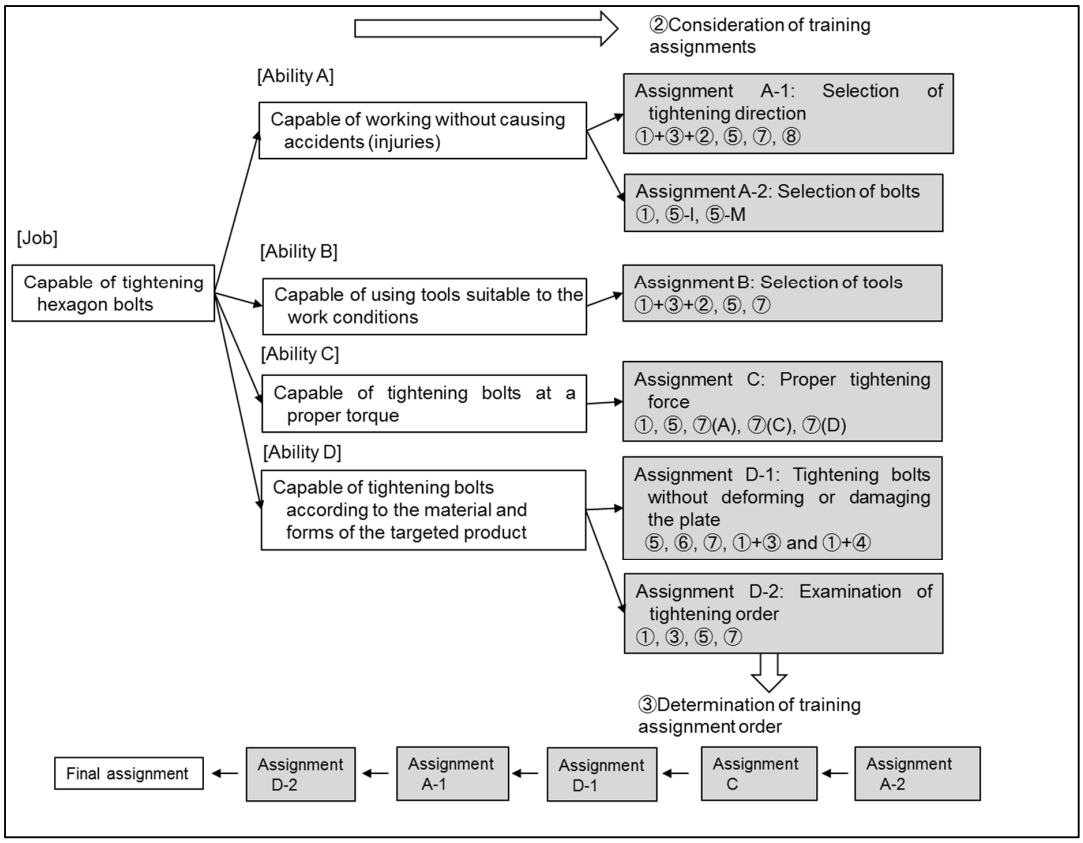


Figure ① through ⑧ are the numbers of each kind of material and tools shown in Figure 4-10.

Figure 4-12 Example of Designing a Training Assignment

4.5.4 Training assignment types

Section "4.3 Instruction Methods Corresponding to Training Items" described examples of instructing knowledge, skills, and attitudes. This section goes further by showing training assignment examples in detail. The examples of training assignments described below are those considered in training assignment ② of Figure 4-12.

(1) Training assignments intended to develop sensory-motor skills

Sensory-motor skills consist mainly of recognition of situations by sensory organs and subtle physical movement which corresponds to what is recognized. A familiar example of these skills is bicycle riding. As for VT, the handle operation of machine tools, and operation of hand tools such as hammers and metal cutting saws are regarded as sensory-motor skills. The figure below (Figure 4-13) shows an example of training assignment intended to develop sensory-motor skills.

[Training assignment C: Proper tightening force]

◆This training assignment is for learning the feel of the force level adjustment for tightening bolts by using tightening tools.

◆Prepare indicating torque tools ⑦(D) to measure the tightening force, and have the trainees measure the tightening force applied to bolts by feel.

◆Have them practice with an open ended spanner ⑦(A) until the bolt tightening force by feel remains within ±5% of the force specified.

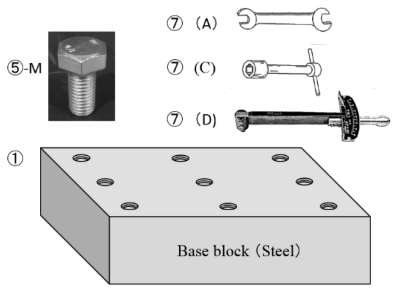


Figure 4-13 Example of Training Assignments for Developing Sensory-Motor Skills

(2) Training assignments intended to develop intellectual management skills

Intellectual management skills consist of abilities of judgment and planning. A familiar example of these skills is examining a route when going to several shops for shopping by bicycle. (Similar assignment is shown in Figure 4-14 as an example of examination of tightening order. In VT, set up work (preparation) and programming for information processing are fall within these skills.

[Training assignment D-2: Examination of tightening order]

◆This training assignment is for training the examination of rational tightening order of bolts.

◆The upper diagram (1) shows a bad example where bolts are tightened from the far right. In this case, bolts are tightened with the left edge of the steel plate ③ floating.

◆The lower diagram (2) shows an example of tightening bolts diagonally to control plate floating and deformation.

◆Other tightening orders can also be considered in this training assignment. VT Instructor can also expect the trainees to enhance their inquisitive spirit by making presentations about the tightening order they considered and their reasons.

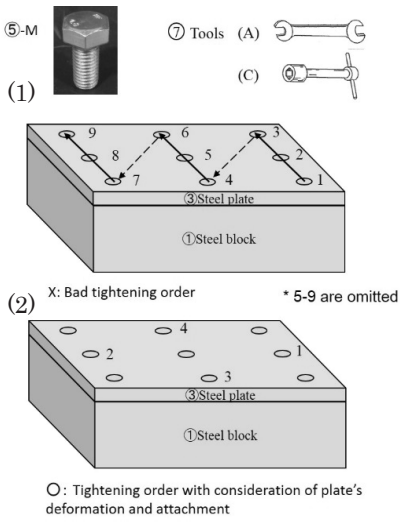


Figure 4-14 Example of Training Assignments for Developing Intellectual Management Skills

(3) Training assignments intended to develop fine attitudes

Attitudes are broadly divided into general attitudes, such as “to be able to say greetings” and “to be able to arrive on time”, and attitudes closely-related to duty performance, such as “to be able to give a clear cue in collaborative work projects” and “to be able to observe predetermined procedures and rules”. The later attitudes, which are closely-related to performance duties, are the main target for training assignments for this practice. Figure 4-15 shows an example of training assignments intended to develop fine attitudes.

[Training assignment A-1: Selection of tightening direction]

◆This training assignment is to learn the attitude to observe keeping rules.

◆Explain disaster cases caused due to the tightening of bolts by pushing the tool toward the obstacle.

◆③; Using the open ended spanner ⑦ (A) may cause injury to the hand due to the obstacle wall when tightening bolts in the left side line bores ③.

◆Prepare the tool ⑦(C) necessary for the above mentioned case in the tool room. Only those trainees who took the trouble to get the tool and tighten the bolts to the proper posture will pass this training.

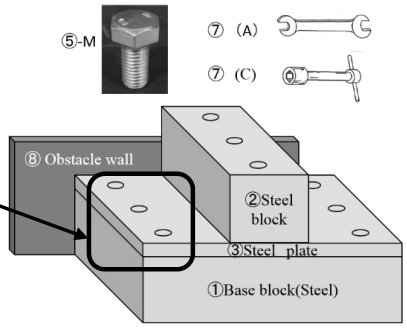


Figure 4-15 Example of Training Assignments for Developing Fine Attitudes

(4) Elemental training assignments and comprehensive training assignments

As described in section “3.6.1 Training assignment”, training assignments are broadly divided into elemental training assignments and comprehensive training assignments. Elemental training assignments are frequently used in the first half of training, while many comprehensive training assignments are used in the second half. Each of the elemental training assignments is hard to be established as an actual duty, but it is necessary for acquiring elemental abilities that serve as the foundation of duty performance. Therefore, many elemental training assignments take a simple form which is not seen in the actual work site. The figure below (Figure 4-16) shows an example of elemental training assignments.

[Training assignment A-2: Selection of bolts]

◆This training assignment trains on how to select bolts fitting to threaded bores.

◆There are inch bolts and metric bolts. Those bolts having similar diameters can be inserted into the bore to a certain degree. Tightening such bolts forcibly can damage them.

◆Prepare more than 10- inch bolts and more than 10- metric bolts, respectively.

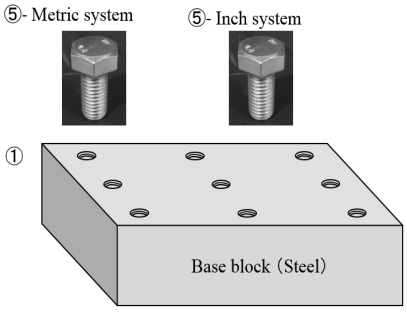


Figure 4-16 Example of Elemental Training Assignments

Comprehensive training assignments are for building the vocational capabilities set as the training objective that match as much as possible to the reality of work site. These training assignments can be implemented only when some elementary abilities are combined. Therefore, comprehensive training assignments tend to take forms that are close to duties assigned at the actual work site. Figure 4-17 shows an example of comprehensive training assignments. This figure explains the content shown in Figure 4-11 in detail.

[Final assignment]

◆This training assignment comprehensively evaluates the proficiency level of each capabilities from A through D extracted by job analysis as shown in Figure 4-12.

◆Due to the obstacle wall, the trainee needs to select proper tools depending on the tightening location. Those trainees who tightened the bolts into the lined up threaded bores on the left edge by the open ended spanner are rejected due to unsafe operation for pushing the open ended spanner toward the obstacle.

◆Use of the adjustable wrench is not permitted as commented in a footnote *** of Figure 4-10. Therefore, those trainees who use this tool are rejected.

◆Points are deducted when washers are not used for tightening bolts into the aluminum plate.

◆There are nine threaded bores to be tightened; have each trainee write their own tightening order on a sheet of paper and submit it to the VT instructor.

◆The threaded bores are in metric. Inch bolts are actually mixed with metric bolts. Those trainees who cannot select metric bolts from mixed bolts correctly are rejected.

◆A quantitative evaluation on the trade skill level will be possible by notifying trainees of the time limit and proper tightening torque.

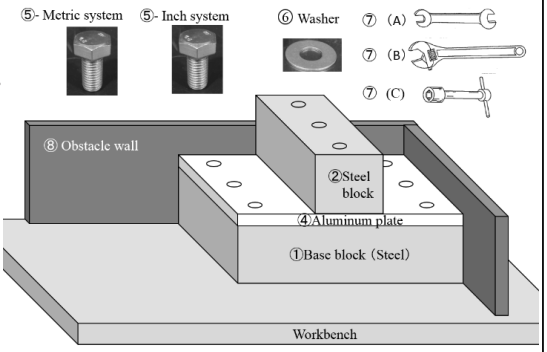


Figure 4-17 Example of Comprehensive Training Assignments

4.6 Evaluation Design

4.6.1 Importance of evaluation design

No matter how good training assignments are completed, it does not make any sense if the VT instructors cannot evaluate the assignments results properly. In order to conduct proper evaluations, the VT instructors need to take care of the four performance attributes, which are described in section "3.5.3 Four performance attributes of training evaluation (adequacy, objectivity, reliability, and economic efficiency)", including balance between these attributes. Particularly, evaluation should conform with the intention of each of the training assignments described in section "4.5.4 Training assignment types", namely the development of (1) sensory-motor skills, (2) intellectual management skills, and (3) attitude. Failing to do so reduces the adequacy of evaluation. For this reason, the VT instructors also have to design assignment evaluations as strategically as training assignments.

4.6.2 Targets for assignment evaluation

Section "3.5.6 Outline of evaluation methods (4) Practical skills test" described that there are four evaluation targets when practical skills tests and training assignments are evaluated. They are ③working result, ④working procedure, ①working attitude, and ②working time. The table below (Table 4-11) shows how each of these targets is evaluated.

An important point in designing evaluations is that all of these four evaluation targets are included. Evaluation fineness can of course vary depending on each evaluation target. Excellent VT instructors tailor their evaluations to the design of training assignments and vary the fineness of evaluations.

Table 4-11 Targets for Assignment Evaluation

Evaluation target	Evaluation contents	Example
Working results	・Quality of results submitted	・Evaluation of dimensions and precision of products manufactured by using a lathe ・Evaluation of programs created and their operating and execution speed ・Evaluation of dimensions and precision of furniture made by woodworking ・Evaluation of operation and beauty of electrical circuits with components installed
Working procedures	・Is standard procedure used for this work? ・Is the work rational and efficient? ・Is the work done safely?	・Lathe machining procedure ・Program designing procedure ・Furniture making procedure ・Electrical circuit designing procedure
Working attitude	・How to face with safety consciousness, quality enhancement, and work efficiency improvement	・Was proper attention given so as not to damage the product during lathe operation? ・Was proper attention given to avoid injuries by tools or chips during lathe operation? ・Is the work place organized and cleaned to enhance workability? ・Is the program developed highly readable? ・Does the program contain comments that help the program's understandability? ・Was proper attention given so as not to damage the product during woodworking? ・Was proper attention given to avoid injuries during woodworking? ・Was proper attention given to avoid burn injuries during the soldering work? ・Was proper attention given to avoid losing components when assembling electrical circuits?
Work time	・Hours spent for completion	・Was the work completed within the standard working hours? ・Working hours are measured for each working process ・How many products can be created within a specified time?

4.6.3 Point allocation plan for training assignments

Training assignments have a wide variety of evaluation targets; therefore, VT instructors need to determine point allocation in advance. At this time, ensuring consistency with "① job analysis" which was considered in section "4.5.2 Design processes for training assignments" is important.

For example, "Training assignment C: Proper tightening force" in section "4.5.4 Training assignment types" is a training assignment for the trainees to acquire "ability C" shown in Figure 4-9. The following items are the subordinate objectives of "ability C".

- Capable of judging the proper fit of the bolt and the threaded bore
  - Capable of judging the foreign substance on feel
  - Capable of adjusting the conditions of the bolt and the threaded bore.
- Capable of applying the specified torque
  - Capable of tightening bolts while measuring the torque by using the indicating torque tool
  - Capable of tightening bolts by using the turn of nut tightening method (the angle method)
  - Capable of tightening bolts by approximate feel

In other words, the VT instructors have to determine point allocation including the above items as evaluation targets. For the purpose of ensuring consistency, the above items have to have high point values.

With that in mind, a rough point allocation plan is prepared as seen in the table below (Table 4-12). According to each evaluation target, this table clarifies the corresponding relationship between each evaluation target and subordinate objectives. For this reason, high point values are allocated when there are corresponding subordinate objectives, otherwise low point values are allocated. By doing so, consistency can be achieved in point allocation.

The point allocation plan decided in this table shows the highest point values for evaluation of each evaluation target.

- Within ±5% of the specified tightening force → 30 points
- Within ±8% of the specified tightening force → 15 points
- Within ±10% of the specified tightening force → 5 points
- Greater than ±10% of the specified tightening force → 0 points

Allocating points as shown in example above, each target can be evaluated on a step by step basis or evaluated with multiple check items.

As for "working attitude", in many cases, the point-deduction system is adopted for evaluation. This table also adopts the point-deduction system, while the highest deduction-point is shown on point allocation column. This system also evaluates each evaluation target on step by step basis. For example, 4 points are deducted every time one scratch is found on a bolt or the base block (maximum of 20 points are deducted).

Table 4-12 Point Allocation Plan

Evaluation target		Corresponding subordinate objective	Point allocation
Working result	Within ±5% of the specified tightening force.	Capable of tightening bolts by approximate feel.	30
	Bolts used are fitting to the threaded bore.	Capable of adjusting the condition of the bolt and the threaded bore. Capable of judging the foreign substance by feel.	20
Working procedures	Capable of measuring the tightening force by using the indicating torque tool.	Capable of tightening bolts while measuring the torque by using the indicating torque tool.	20
	Tightening tools are used by correct procedures.	Capable of tightening bolts by using the turn of nut tightening method (the angle method). Capable of tightening bolts by approximate feel.	20
Working attitude	Bolts or the base block are scratched.		(-20)
	Tools or materials are dropped.		(-10)
	Bolts are damaged.		(-30)
Working time	All work was completed within the specified working time.		10

4.6.4 Highly-objective marking

Training assignments are frequently marked by the VT instructors on their own subjective judgments while evaluating the achievements and observing the trainees' behavior. However, the more the marking standard varies depending on each VT instructor, the lower the evaluation objectivity becomes. Therefore, necessary efforts should be made in order to enhance objectivity. To achieve this, the marking standard needs to be defined based on the marking method shown by the table below (Table 4-13), while recording all marking results on a specified record sheet.

Table 4-13 Marking Method

Evaluation target	Marking method
Working results	Mark after measuring the achievement completed after work.
Working procedures	Observe the behavior of the trainees working on training assignments. Record the results on a recording paper such as check sheet and mark their evaluation.
Working attitude	
Working time	Keep the time spent for work, or set deadlines and record the amount of overtime when it is past the dead line.

4.7 Implementation of Lessons

4.7.1 Motivation of trainees

When a training course is established, the VT instructors set the training objectives and the attainment objectives for their training course. Therefore, the VT instructors are able to be conscious of the relationship between the training objectives and the attainment objectives. Similarly, the VT instructors are able to be conscious of the relationship between work and the attainment objectives. However, it is difficult for the trainees to connect the training objectives, the attainment objectives, and work together.

For this reason, the VT instructors are required to motivate the trainees when opportunities arise during the training course. Motivation means more than merely encouraging the trainees to arouse their feelings of enthusiasm. Rather, it plays a role in connecting the training objectives, the attainment objectives, and the work.

In particular, motivation which is conducted at the beginning of the training course is significantly important. At this point, the trainees don't know about the job trade which is associated with their training. Therefore, the VT instructors need to explain in an easy-to-understand way what kind of work the trainees can do by acquiring the content of the training. Moreover, the VT instructor needs to explain as to what kind of problems will bother trainees with their work, if the trainees fail to acquire the content of the training. Additionally, excellent VT instructors also tell the trainees about what kinds of connection and the relationship that could exist between the attainment objectives of the present training course and those of other training courses.

In other words, the motivation stage conducted at the beginning of the training course does not finish in a couple of minutes. The VT instructors have to preserve enough time for the designing of the instruction plan and give lectures which all the trainees will be convinced.

To achieve this, the VT instructors start their preparation in the stage of lesson design. The VT instructors do careful research on job trades that are closely related to the training, clarifying relationship between the training objectives, the attainment objectives, and the work, while making an effort to be capable of describing this relationship in their own words.

At this time, the VT instructors assume what knowledge the trainees actually have beforehand, and they have to keep their descriptive lectures within the scope of the trainees' knowledge. Therefore, as needed, the VT instructors prepare necessary figures, video materials, or other complemental materials that supplement deficient knowledge of the trainees. If the knowledge status of the trainees is unclear, the VT instructors make every effort to understand by asking the previous VT instructor who trained the trainees before, or by observing the previous training session. It is also a good idea to check the career of the trainees. The more the assumption for background of the trainees become accurate, the more they can succeed in motivating the trainees.

Furthermore, a target analysis chart is useful when the VT instructors try to tell the trainees what kind of relationship and association actually exist between the attainment objectives of this training and those of other training courses. This chart indicates that the trainees can reach higher objectives when they have achieved all subordinate objectives. In other words, this chart clarifies the level of attainment objectives which the trainees will not be able to reach in the future unless they achieved the present attainment objectives in the current training course.

Actually, motivation is not conducted only at the beginning of the training course. The VT instructors conduct motivation at every milestone for each training item. However, this motivation does not take much time like the one conducted at the beginning of the training course. In this motivation session, the VT instructor speaks about the following points in a short time.

- Topics that make the trainees remind the motivation stage conducted at the beginning of the training course
- Connection between the previous training item and the succeeding training item
- Position of the current training topic for the training objectives and the attainment objectives

The VT instructors might explain about the points other than the above-mentioned things. This motivation is conducted in order for the trainees to keep memory of the relationship between the training content and work, and also to engage in training with future prospects.

Whether or not it was conducted at the beginning or at each milestone during the training course, the result of its success or failure will be reflected on the attitude of the trainees. Proper motivation that moves the trainees can really enhance the training effects. Therefore, this activity should not be neglected.

4.7.2 Easy-to-understand speech for trainees

The VT instructors must observe the following points on their speech during the training course. These are the basic of basics.

- Speak at a proper speed so that the trainees can easily catch up.
- Speak with proper volume so that all the trainees can listen.
- Avoid using non-related or unnecessary exclamation marks or sounds, such as “um...” or harrumphing.
- Avoid a chalk talk. Speak facing the trainees after finishing drawing or writing on the board.

This section also introduces how you should speak in order to give even more easy-to-understand explanations to the trainees.

First of all, the VT instructors must avoid speaking one-sidedly if they want to give an easy-to-understand explanation to the trainees. The VT instructors have to check the reactions of the trainees from time to time during their explanation.

This can be done by observing the trainees and their reactions. The VT instructors observe whether the trainees are nodding to them during their talk. Additionally, the VT instructors could also ask questions occasionally in order to confirm whether the trainees can understand what is explained. If the VT instructors’ speech is clear and understandable, many trainees are nodding or listening carefully while looking at VT instructor.

If there are many trainees who are not nodding or who are tilting their heads, it means that VT instructor speaks in a way which is difficult to understand for the trainees.

If this is the case, the causes listed below could be considered.

- The VT instructor is using technical term that is unfamiliar to the trainees.
- The trainees cannot imagine the scenes and situations brought out by the VT instructor due to lack of experience.
- The trainees do not understand the background or circumstances as the premise.
- The order of the topics mentioned by the VT instructor is not in chronological order.

Removing above causes lead the instructors to a practical speech which is easy-to-understand for the trainees.

An attempt to confirm the knowledge level of the trainees in advance can help the VT instructors understand whether the trainees know some particular technical term or whether they have experienced particular situations or circumstances. Section “4.7.1 Motivation of trainees” describes how the VT instructors can confirm the knowledge level of the trainees.

The background and conditions as premise for an explanation are frequently regarded as a matter of cause for the instructors. Therefore, VT instructors tend to omit giving the trainees necessary explanations about such information. The senior VT instructors are more frequently tend to omit giving necessary explanations. Caution should be exercised. For this reason, basic explanations should be consciously incorporated into the main topic of the lesson.

Chronological inconsistency in which they speak could cause confusion to the trainees. Therefore, the VT instructor needs to avoid speaking in an off-the-cuff way. Rather, they have to speak while being conscious of the chronological order by referring to the operation procedure.

As an example of the motivation, the section below shows a bad example and a good example regarding the way of speaking. Here, it is assumed that the trainees belong to the training course to acquire Internet technology. However the trainees do not have any basic knowledge of the internet since the training course has just started.

The next example shows a speech where the background and explanation of the situation are omitted and is difficult to understand for the trainees due to being outside and beyond the scope of their knowledge or understanding. Shaded portions are those significantly outside and beyond the scope of the trainees’ knowledge.

[Example of difficult-to-understand speech]

The Internet is connected by TCP/IP, and it is very important to know this fact. For example, you have experienced network trouble due to congestion, haven’t you? This might be due to problems existing in the separation of segments. By using knowledge learned through this lesson, let(s build a comfortable Internet environment.

If those individuals have related expertise and experience, the above speech is easy to understand. The VT instructors unintentionally speak in the way described above because they have expertise and these experience.

The following example is also about completely the same topic as above. However, words and expressions are changed based on consideration of the scope of trainees' knowledge. Furthermore, the background and conditions where the explanation are omitted in the previous example are also explained. Shaded portions are those with words changed and explanations added.

[Example of easy-to-understand speech]

It is very important to know that the internet is connected with unified technological specification and protocols called TCP/IP so as to use various electronic devices all over the world. For example, you may have experienced some trouble with a network, where it becomes quite slow and heavy. If this occurs frequently, there might be problems that originate with the network design. Learning TCP/IP enables you to understand how such a network should be designed. By using knowledge learned through this lesson, let's build a comfortable Internet environment.

As shown in these examples, the VT instructor have a tendency to unintentionally use technical term which is unfamiliar to the trainees or fail to explain the necessary background or conditions. Therefore, the VT instructor first needs to understand to what extent they can omit explanation and comments on specialized knowledge to the trainees. Additionally, they try to replace difficult technical term and terminology with other plain words and expressions, while adding necessary explanations about the background and conditions. If such replacement or addition of explanations is difficult, the VT instructors should prepare some supplemental materials including diagrams or video material.

It should be noted that when creating lesson plans, VT instructors can prevent incorporating difficult-to-understand speech. To do this, VT instructors have to prepare, create, and elaborate on a lesson plan in great detail. In other words, the instructors have to consider trainees' knowledge scope and lesson procedure which does not confuse the trainees during creating lesson plan.

Not only above difficult-to-understand speech, but the VT instructors sometime make trainees confuse. Whatever the case may be, the VT instructors must read the reactions of the trainees whether they understand or not. If not, the VT instructors need to trace the causes of why the trainees appear not to understand and they have to improve on what they find out.

4.8 Response to Difficulties of Trainees

As described in "(3) Response to various conditions of trainees" of section "2.3.3 Management items concering rationality and efficiency toward objective of training", the VT instructors are responsible for offering support for the trainees under conditions that could cause the trainees difficulty in sitting for a training. Support is offered through personal interviews conducted with individual trainees. Through personal interviews, the VT instructors advise each individual trainee on how they can cope with difficulty.

In many cases, VT targets the unemployed especially, whose base for living are unstable and fragile. Therefore, some trainees need to stop training due to economic reasons. The VT instructors give some advice after perceiving what measures or assistance can be made in order to support the base for living of the trainees during the training period.

Due to unstable base for living, the mental health of the trainees might deteriorate. If this is the case, the VT instructor needs to notice changes in the trainees as early as possible, and give them advice to receive special counseling services from specialists or medical institutions.

Additionally, it could result in human-relation problems or conflicts between the trainees. When this kind of situation arises, the VT instructors need to interview both parties in order to solve the problem.

The key to success in responding to the difficulties of the trainees to continue sitting for the trainings is that VT instructors detect such signs as early as possible. In some cases, when the trainee comes to the VT instructor for consultation, the relevant problem has already become too serious to solve. Therefore, the VT instructors must find out and respond to such problems while they are still quite small.

To find out such problems, being observant of all the trainees is an essential thing to do. Mainly, the VT instructors need to be observant regarding the following points.

- Changes in conditions of taking training, attendance, late arrival, and leaving early
- Changes in grades
- Changes in training motivation
- Changes in dress and grooming
- Changes in human relationships among the trainees
- Job-hunting conditions

There are so many reasons of trainee's problems. If a certain trainee's conditions deteriorate, such as attendance, late arrival, leaving early, grades, training motivation, or grooming, and if these causes seem to be not related to the training, there might be trouble in his/her home. If a trainee's changes in attitudes are related to human relationships among the trainees, for example, the trainee appears to be isolated or other trainees ignore the trainee, trouble might arise. If a trainee's job-hunting activities seem to be inactive, his/her mental health could deteriorate.

Observation can enable the VT instructors to detect such changes early, so that they can make necessary preventative measures and solve the trainee's problem.

Now, there is one more important matter about the response to a difficult situation of the trainees to attend a training course. It is to make a systematic effort. In many cases, problems cannot be solved by only a single VT instructor.

For example, observation for early detection will be difficult in a system where the VT instructors take turns according to the training subject. This is because information regarding attendance, late arrival, and leaving early during the training period is separately managed by each individual VT instructor in charge of the training subject. Therefore, a systematic effort should be made in order to share such information in a horizontal manner. Additionally, coordination between counselors and staff members should be required to respond to mental health deterioration of the trainees.

Therefore, this response to difficult situation of the trainees to attend a training course cannot be done by a single VT instructor alone. All related staff members and VT instructors must cooperate together to make the necessary responses to such situations. A quick solution for a problem of trainees will become possible by making systematic and organizational efforts.

POSTSCRIPT

Vocational Training Instructors Manual for ASEAN Development Committee (here in after reffered as "GAIN Development Committee") introduced vocational training instructor duties mainly on vocational training course management of Japan form 2013 for three years. The VT is demanded to contribute to the ability development of the worker, and how we implement VT course effectively and efficiently must be considered. Therefore, the training institution and instructor are required to improve training courses by the PDCA cycle management.

By this time of GAIN, I would like to ask that the quality of the training course is a step forward.

Finally, in order to contribute to ability development of workers in your country, I state the skill level for instructor and do it with my postscript.

Yoichi Kimura
(Chair of GAIN Development Committee)

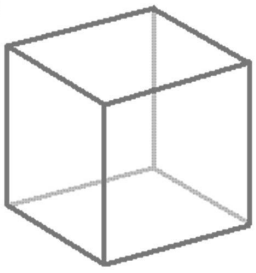
Skill Level Underpinning Training Ability

First, VT instructors train their trainees to feel the enjoyment of manufacturing. Manufacturing is originally fun, amusing, and fascinating.

Therefore, the instructors are required that they themselves have already experienced the enjoyment of manufacturing. The human cannot teach what they do not know, of course. Instructors can never train or explain to trainees about the things beyond what they know about or experienced.

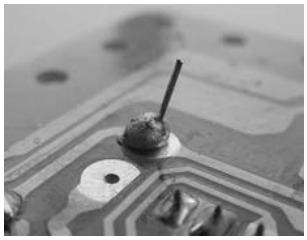
Additionally, we often hear that capable skilled workers at small and medium-sized enterprises (SME) are not good at training younger workers as successors. We can consider this to be the weak point of OJT implemented at SMEs which exposes the fact that the work standard sheets have not been created and the seniors have not learned the training methods. This should be one of the issues underlying human resource development at SMEs. At VT institutions, papers for acquiring various trade skills and techniques including textbooks for practice and work standards sheets are prepared, while training courses are implemented. The VT instructors, who learn training methods and psychology of trainees, prepare for workshops and necessary equipment prior to beginning their classes. Moreover, they start their classes only after elaborating ideas of lesson plan. They are professionals, so that these things are natural processes for them to take. It is also a royal road of training technique to lead the trainees toward training goals set while presenting easy challenges first followed by sophisticated challenges according to the acquisition process of trainees.

The below figure is an example of introduction stage for soldering training where trainees check the result of soldering by themselves. At the first time, trainees are trained basic soldering skill, and trainees create a cube by soldering 12 electrical wires together. Then a cube is left it in the store room for 3 months. After 3 months, the results are confirmed. While these 12 electrical wires appear to be completely soldered initially, but they often result in loosening in pieces after 3 months. Through this training method, the trainees can experience the shock that their soldering skills were inadequate and defective although the soldering appeared to be good at first. After this experience, full-fledged soldering instructions are started. Since the trainees have already had a bitter experience, they feel that the instructions given are really straightforward and they become serious about acquiring steady soldering skills so that they will not repeat previous mistakes. This process is just example and for long time training. It's not necessary to start with failure, there are so many ways to initialize lesson. How does instructor motivate trainee is the important factor. The method is depending on instructor's experience.



In manufacturing training, the instructors are required that they have acquired a high skill level and technique in addition to the acquisition of pedagogical techniques. There certainly exist the textbooks for soldering, while the classes are conducted according to what such textbooks explain, and at any rate trainees can come to the point of being able to solder certain objects. However, the results of their learning are clearly revealed after 3 months. As this case shows, true acquisition of skills is very difficult for them. Although the trainees appear to develop their skill by following what the textbook explain, defects can actually be found from place to place.

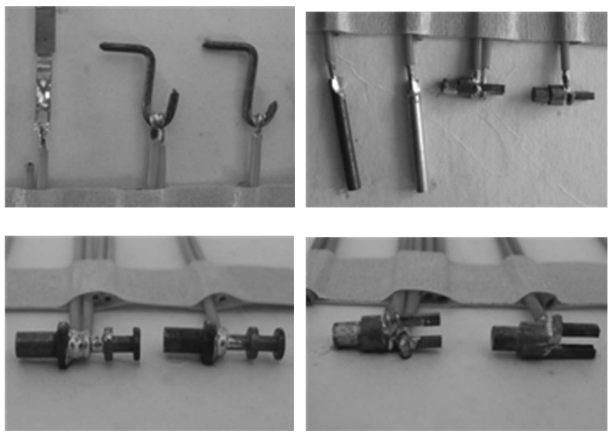
The same thing can be said of the instructors. Even though instructors attempt to implement training just after practicing the related skills a couple of times by following what the textbook explains, it is impossible to evaluate the acquisition level of each trainee. What is even worse, instructors cannot give the trainees any opportunities for them to realize anything. Instructor cannot point out the defects made by the trainees, and also cannot find out the reasons why trainees made such mistakes. This is because such mistakes could be caused due to reasons which vary depending on each individual trainee, such as physical capabilities or their attitude toward work.



Therefore, we have to consider that the instructors are able to implement training only after instructors themselves have acquired the related skills in order to reach a certain level of confidence. Instructors would have to realize how the skills can be acquired by repeatedly making similar mistakes through challenging. Skills and techniques can be acquired only by making serious efforts to acquire those skills, techniques, intuitions, and knack that are not described in working standards sheets or textbooks. The instructors can be capable of realizing the mistakes and finding out the reasons and causes why the trainees cannot complete certain skills, only after taking the above-mentioned acquisition process themselves. The instructors are capable of giving just the right tip while observing how the trainees do their work, only because they themselves have gone through this acquisition process.

Soldering skills require various abilities, such as how to heat electrical wires and joint materials, how to handle the soldering iron, the solder condition of the electrical wire tip, and the amount of solder. They also depend on the soldering conditions of different materials, their qualities, or the number of electrical wires to be connected (one or two), as shown on the left.

While the trainees are challenged by the assignments, they can have confidence by completing each assignment and experience the enjoyment of soldering. VT offers opportunities for the trainees to realize the enjoyment of manufacturing and learn how to get close to the essence of manufacturing based on the process of acquiring skills through trial and error. It is impossible to stimulate the trainees' motivation and to realize the enjoyment and essence of work by merely completing textbook quickly. The example of 12 wires cube is also designed by such instructors' experience.



Soldering assignments: Provided by Mr. Kakisu, Director of Japan Employability Support Orgnization

The VT instructors are required not only to have a high level of pedagogical ability, but also to have highly-qualified. Because, instructors' highly skills gives trainees challenge spirits and the fun of manufacturing.

Even those instructors with expertise other than the electronics field must be capable of understanding the meaning and significance of the soldering assignment photos shown above. They are required to develop insight on how the assignment can be and are actually applied to their own areas of expertise. This group of assignments could be a letter of challenge for their trainees to understand the enjoyment of manufacturing and work.

When training has been completed, each trainee finds employment where a certain amount of work assignments are given to them to carry out within that company. They carry out their duties based on the enjoyment of challenging assignments and use what they have learned about manufacturing during their training. The main job of the instructors is to have the trainees understand the greatness of working in manufacturing. If the instructors do not realize the enjoyment of manufacturing, they can never train the trainees how wonderful manufacturing is. If the instructors do not aware of the wonderful impression of manufacturing, they can never tell the trainees about this impression. Above all, the instructors are required to acquire high-level skills and techniques thoroughly by themselves.

Vocational Training Instructors Manual for ASEAN

GAIN

(Guide for ASEAN Instructors)

Appendix

(Revision 1.0)

APPENDIX

1 Analysis of VT Instructor's Operations and Duties and Human Resources Development

(Prepared based on the "Human Resources Development System 2009" by JEED, introduction of outline)

The Human Resources Development System 2009 is a system to allow the abilities of VT instructors who are limited in number to be fully utilized. This human resources development system was started in FY2009, with the purposes of maintaining and improving the credibility of the capacity building by the JEED and the quality of training and contributing to the development of vocational skills, focusing on human resources development.

The system aims to develop the abilities of VT instructors, mainly focusing on OJT, by clearly stating the ideal image of VT instructors and their operations.

1.1 Purpose

When the Human Resources Development System 2009 was established, its purpose was set as: "establish an environment wherein people can work with motivation for achieving the objectives of the organization, by respecting the working style of each VT instructor while capitalizing on their individual strengths and promote the instructors' operations and their capacity building according to individual objectives set by considering the skills and aptitude of the individual instructors".

1.2 Roles of the organization and the ideal image of VT instructors

The characteristic of this system is that it facilitates the setting of human resources development objectives by clearly showing the roles of the organization and the ideal image of VT instructors.

(1) The roles that the JEED should play

The major roles of the JEED are: (i) securing the safety net for employment, (ii) securing and developing human resources for small- and medium-sized enterprises, (iii) development of workers' careers, and (iv) promoting the development and diffusion of techniques for training methods and capacity building.

(2) Ideal image of VT instructors

In order to serve the role of the JEED securely, the skills expected for VT instructors is clarified as follows, and their skill building is implemented.

①The VT instructor understands the mission and role of instructors and has good sense and broad knowledge.
②The instructor has expert knowledge, skills and techniques. In addition, he/she is familiar with the situation of the actual production site and can describe the job.
③The instructor has the ability to detect and solve problems, and can give technical advice to job seekers and workers in the fields of skills and techniques.
④The instructor can utilize training methods to pass on skills and teach technologies.
⑤The instructor can give consultation and support related to vocational career development according to the ability and aptitude of the job seeker or the worker.
⑥The instructor has formed an attitude as a worker in the industry, an educator and a consultant.
⑦The instructor has passion, confidence and humility (he/she can win trust and be respected as an authority).

1.3 Setting the human resources development objectives

Objectives (objectives for operation and skills development) should be set by each VT instructor. However, such objectives should be consistent with the direction of the organization's objectives, otherwise the instructors will not feel a sense of fulfillment even upon accomplishing those objectives. Therefore, in this system, the working style of VT instructors expected by the organization and their necessary abilities are clarified so that they are able to set clear goals.

Table 5-1-1 Duties of VT Instructors (some of the ideas of the duties)

Department	Duties	Content		
Training management	**Formulation of the training plan**	**Planning of VT courses**	**Planning management**	**Promotion of training plan**
		Assisting the formulation of the annual plan Development of VT courses Formulation of curriculums	Planning the annual plan Budget planning VT course process management	Evaluation and improvement of the annual plan
	Preparation of equipment	**Preparation of equipment**	**Management of equipment**	**Promotion of the preparation of equipment**
		Creation of equipment ledger Creation of tools ledger Creation of materials ledger Maintenance of equipment and tools	Equipment preparation planning Equipment maintenance planning	Evaluation and improvement of equipment preparation
	Preparation of facility & equipment	**Preparation of facility & equipment**	**Management of facility & equipment**	**Promotion of the management of facility & equipment**
		Creation of property ledger Formulation of facility & equipment ledger	Facility & equipment preparation planning	Evaluation and improvement of preparation
	Preparation of training raw materials	**Preparation of training materials**	**Management of training materials**	
		Creation of training materials (texts and teaching aids) Intellectual properties and copyright Collection of information for training materials	Storing and management	
	Management of trainees	**Selection of those admitted**	**Management of the selection of trainees**	**Promotion of selection management**
		Creation of selection and evaluation table Exams and interviews	Admission decision	Evaluation and improvement of selection method Coordination with “Hello Work”
		Career formulation support	**Career support management**	
		Individual instruction (respect for human rights) Group instructions Placement support	Finding of the place of employment Consultation and instructions on employment	
		Follow-up of trainees	**Follow-up management**	**Promotion of trainee assistance**
		Status survey on the employment situation of trainees	Providing consultation Continuous support	Evaluation and improvement of follow-up
	Training management	**Holding events**	**Management of events**	
		Enrollment ceremony, orientation, commencement ceremony	Evaluation and improvement of events	
		Safety and health	**Safety and health management**	

		Instructions on safety and health Creation of safety manuals	Evaluation and improvement of safety and health management instructions Environmental preservation management	
		Training implementation	**Training management**	**Promotion of training management**
		Preparation for training implementation Training implementation Evaluation of training implementation	Evaluation and improvement of instruction method Evaluation and improvement of training materials	Evaluation and improvement of PDCA
Development support management	**Technical support**	**Technical support**	**Technical support management**	**Promotion of technical support**
		Collection and provision of technical information Collection and provision of information on training materials	Planning and adjustment of contracted research	Research on technical trends
	Support for employers	**Support for associations and companies**	**Management of support for associations and companies**	
		Support for skill building Support for employment management	Support planning and management	
	Collection of information on companies	**Visits to associations and companies**	**Management of visits to associations and companies**	
		Survey on the actual situation of skill building companies	Management of survey on the actual situation	
		Survey on company information	**Management of information collection**	
		Creation of survey sheet Company survey	Understanding the situation of regional industry Information collection and analysis	
Institution administration and management	**Public relations and recruiting**	**Public relations and recruiting**	**Management of public relations and recruiting**	**Promotion of public relations and recruiting**
		Creation of public relations draft Public relations activity Understanding the application for trainees and students	Selection of the place to post public relations information Public relations planning Analysis and evaluation of application	Evaluation and improvement of public relations
	Operation of systems and divisions	**Operation of systems**	**Management of systems operation**	**Promotion of systems operation**
		Preparation for holding conferences Creation of materials and minutes	Operation of systems conferences PDCA cycle promotion	Evaluation and improvement of operation

	Operation of committees	**Holding committees**	**Management of committees operation**	**Promotion of committees operation**
		Coping with various events for those outside the organization Preparation for committees	Facilitation of committees Progress management	Evaluation and improvement of operation
Human resources development	**Human resources development**	**Development of new VT instructors**	**Development of young VT instructors**	**Development of mid-level VT instructors**
		Advice and instruction on areas of expertise Acquisition of expertise Training management support Institution administration and management support	Planning the instruction Acquisition of expertise Performance instruction	Management of instruction plan Acquisition of expertise Performance instruction

1.4 Development stages

In order to promote the human resources development through the process of operation (OJT), all VT instructors are positioned in four development stages (newcomer, mid-level, quasi-veteran, and veteran), and operations and development assignments are set for each stage. At the same time, a system of ranks (such as senior VT instructors and chief VT instructors) is set for supporting problem solving for each instructor, with the expectation of proactive efforts as a team. Thus, the system provides an occasion for individual VT instructors to work by capitalizing on their strengths.

(1) Newcomer group (around 25 years old)

Instructors of this group are expected to acquire accomplishments as a VT instructor, and to have an ability to implement and manage a VT institution.

(2) Mid-level group (around 32 years old)

VT instructors of this group are expected to be able to implement and manage a VT institution while accumulating various experiences and also provide OJT to junior fellow VT instructors.

(3) Quasi-veteran group (around 40 years old)

VT instructors of this group play a central role in promoting the implementation and management of a VT institution and provide OJT to junior fellow VT instructors.

(4) Veteran group (around 52 years old)

Instructors of this group are in charge of management and the development of junior fellow instructors regarding the training instruction/implementation and training management.

1.5 Recommendations on the VT instructors development program in developing countries

It is known from past experience of VT support that VT instructor's operations are not always clear. Even in Japan, VT instructor's operations became clear only in 2009, when the Human Resources Development System 2009 started. It took 51 years from the enactment of the Vocational Training Act (VT Act) in 1958. Although VT measures have changed and the operations provided by VT instructors also went through transition during this period, they were written clearly for the first time in 2009, and the operations were visualized.

The basic idea is to aim for skill building by clarifying the skill building policy for VT instructors to promote their operations with pride, based on the purpose of the establishment of VT organization. What is important here is the visualization of operations and skill development.

It is considered that such visualization and the setting of skill development objectives should be effective as skill building measures for VT instructors in developing countries. However, VT instructor's operations differ by the situation of each country and VT institution, and it should not be sufficient to simply import the division of operations in Japan as it is. It should be newly created by considering the state of affairs in the country, budget, allocated staff and so on. At the same

time, the mere clarification of the operations may only result in evaluation, and not in actual human resources development. A system fully considering human resources should be established.

2 Skill Map

2.1 Outline of skill map

Human resources development in companies should be implemented according to the plan. The plan should be in line with one's everyday operation and should have a systematic and phased curriculum. The first step that should be taken is to clarify the tasks in everyday operation (operations analysis), and to create map that systematically summarizes such duties (skill map). By creating a skill map, issues can be shared within the organization and the problems of human resources development that can be clarified.

The skill map has a tree-like structure (Figure 5-2-1). It is also divided into three layers, namely "organizational structure", "operation" and "actual work".

In the first layer, the organizational structure, the entire operation function of the company is divided roughly into "departments" according to types and systems. Under each department comes "duties", which are divided by the operation functions.

In the second layer, operation, further segmentation is implemented into "tasks", which are the minimum units of operation function that can be allocated separately to each duty. Each task is further divided into "works", which is the indivisible unit of the series of related actions conducted by a single worker.

In the third layer, each work is divided into "skills and techniques", which represents the specific actions for work implementation. All skills and techniques are further divided into "knowledge" on judgment standards and on points of improvement.

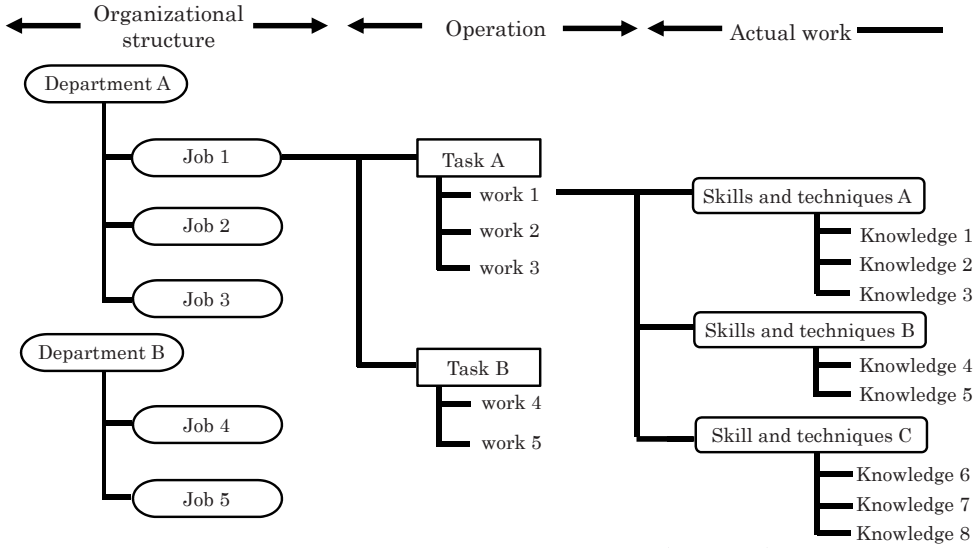


Figure 5-2-1 Example of Point of View for Skill Map

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)

(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

In addition, the skill map sets level segmentation for tasks. The setting standards are as follows:

Level 1: Work to nurture the foundation of corporate profit

Level 2: Work to generate corporate profit

Level 3: Work to lead the corporate profit

Level 4: Work to create corporate profit

2.2 Formats of skill map

There are 1 to 4 formats of skill map.

Format 1 shows the entire picture from a bird's-eye view.

Lifelong human resources development system

Type of industry: Metal cutting machine tool manufacturing

Format 1

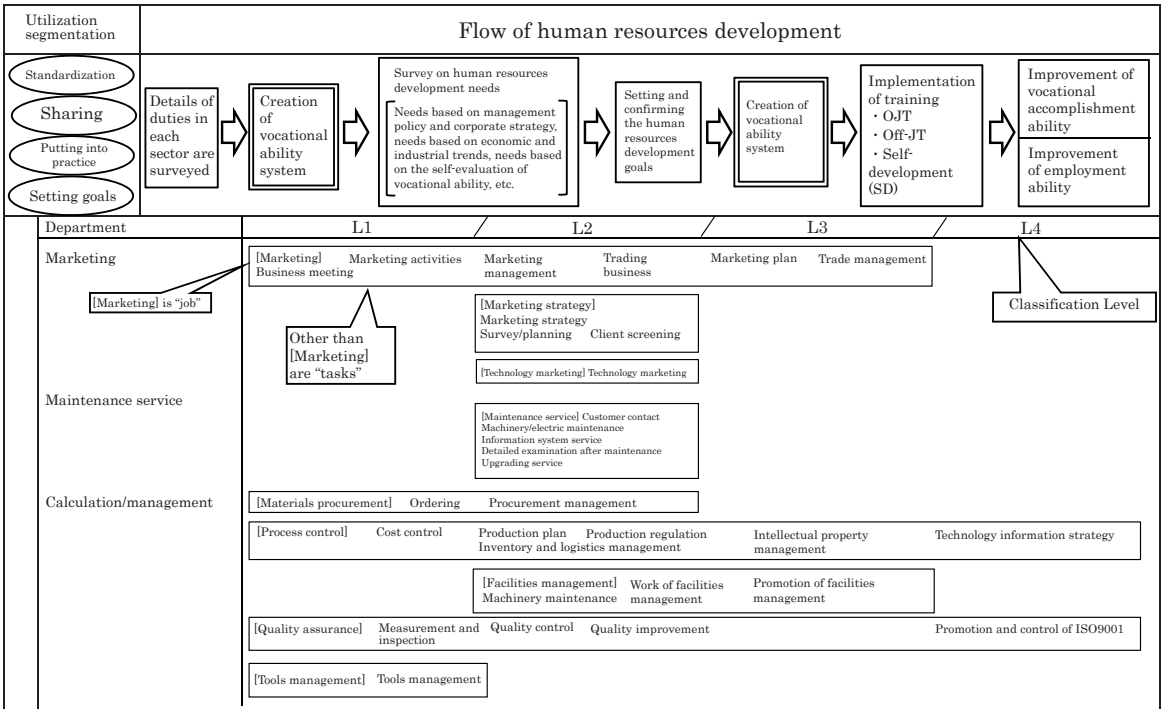


Figure 5-2-2 Format of Skill Map (excerpt)

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)

(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

Format 2 shows the "work" in a systematic and phased manner.

Type of industry: Metal cutting machine tool manufacturing

Skill map by "job"

Format 2

Department	Job \ Level	L1	L2	L3	L4
Marketing	Marketing	Marketing activities Business meeting	Marketing management Trading business	Marketing plan Trade plan	
	Marketing strategy	Work	Marketing strategy Survey/planning Clients screening		
	Technology marketing		Technology marketing		
Maintenance service	Maintenance service		Customer contact Machinery/electric maintenance Information system Detailed examination after maintenance Upgrading service		

Figure 5-2-3 Format 2 of Skill Map (excerpt)

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)

(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

Format 3 shows the relationship between the “task” and “work” under it.

Type of industry: Metal cutting machine tool manufacturing

Work by “jobs” Format 3

Department	Job \ Level	L1	L2	L3	L4
Manufacturing	Turning processing	Lathe processing			
		Outside diameter processing			
		Groove processing			
		Knurling			
		Inside diameter processing			
		Screw processing			
		NC lathe processing			
		Programming (NC lathe processing)			
		Setup			
		Processing			

Task

Work

Figure 5-2-4 Format 3 of Skill Map (excerpt)

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)
(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

Format 4 shows the “skills and techniques” necessary for the “work” and the required “knowledge”.

Type of industry: Metal cutting machine tool manufacturing

Details of “work” by “job” Format 4

Job	Turning processing		Level	L1
Task	Lathe processing			
Work	Skills/Technique	Details of works		
1 Outside diameter processing	1	Be capable of setting outside diameter processing conditions		
		Know how to read a machinaery drawing		
		Know about the machinability of each material		
		Know about the three elements of cutting condition		
	2	Be capable of selecting adequate cutting tools		
		Know about the names and functions of the parts of cutting tools		
		Know about the materials of cutting tools		
		Know about coating		

Knowledge

Figure 5-2-5 Format 4 of Skill Map (excerpt)

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)
(Note: The origin of quotations may change the contents and their expression without notification, now or the future.)

2.3 Skill map model

Even if a department in charge of human resources development in each company wants to create a skill map, it may be difficult if daily operations are excessive, because the process takes a lot of work and time. JEED develops and publishes a standard skill map model for each job category, from the perspective of ensuring the convenience of users. As of June 2013, 93 industries (approximately 2,700 duties), primarily according to the small classification by the Japan Standard Industry Classification are developed.

Table 5-2-1 93 Industries of Skill Map Model Published by JEED

Large classification		Medium classification	Implemented industries
A	Agriculture, forestry	Agriculture	(1) Rice cropping, cropping of grain other than rice (2) Vegetable cropping (open culture) (3) Vegetable cropping (facilities culture) (4) Dairy farming (5) Forestry
D	Construction business	Comprehensive construction	(1) Civil engineering work (2) Landscaping work (3) Construction work
		Construction by occupation	(1) Carpenters' work (2) Scaffolding work (3) Steel-frame work (4) Reinforcement placing work (5) Plastering work (6) Sheet-metal and metal work (7) Painters' work (8) Floor and interior work
		Facilities construction	(1) Electric work (2) Telecommunications work (3) Air conditioning and ventilation facilities work (4) Water supply/plumbing and sanitary work
E	Manufacturing	Food manufacturing	(1) Bread manufacturing (2) Ready-to-eat food manufacturing (3) Meat-processed food manufacturing
		Textile industry	(1) Outer garment and shirt manufacturing (excluding Japanese style)
		Furniture and fixture manufacturing	(1) Wood furniture manufacturing
		Pulp, paper, paper processed products manufacturing	(1) Paper containers manufacturing
		Printing and related business	(1) Printing (2) Bookbinding
		Plastic products manufacturing	(1) Industrial plastics products manufacturing
		Ceramics and earth and rock products manufacturing	(1) Glass containers manufacturing
		Iron and steel business	(1) Pig iron and cast metal manufacturing (2) Forged product manufacturing
		Metal products manufacturing	(1) Machinery blade manufacturing (2) Construction-metal product manufacturing (3) Metal-press product manufacturing (4) Metal heat-treating business
		Nonferrous metal manufacturing	(1) Nonferrous metal forging ([forging, die-cast] manufacturing)
		Conventional machinery and tool manufacturing	(1) Logistics and transportation facilities manufacturing
		Manufacturing of machinery and tools for production	(1) Construction machinery and mining machinery manufacturing (2) Metalworking machinery manufacturing (3) Machinery and tool manufacturing (4) Manufacturing of molds for plastic injection and molding (5) Manufacturing of dies for metal press

Large classification		Medium classification	Implemented industries
		Professional-use machinery and tool manufacturing	(1) Measurement instruments manufacturing (2) Manufacturing of lenses and prisms for optical machinery
		Electronic components, devices, electronic circuits manufacturing	(1) Integrated circuit manufacturing (2) Electronic circuit board manufacturing (3) Electronic circuit mounting board manufacturing
		Electric machinery and tools manufacturing	(1) Consumer electric machinery and tool manufacturing
		Information and communications electronics equipment manufacturing	(1) Information and communications electronics equipment manufacturing (related to embedding) (2) Manufacturing of information and communications electronics equipment machinery and tools and related machinery and tools
		Transportation equipment and tool manufacturing	(1) Automotive part and accessory manufacturing
G	Information and communications	Information service business	(1) Information service business
H	Transportation, postal service	Road passenger transportation	(1) Transportation of reserved general passenger cars (including the transportation of share-ride general passenger cars)
		Road freight transportation	(1) Transportation of general freight cars
I	Wholesale, retailing	Wholesale of various commodities	(1) Wholesale trade of various commodities
		Wholesale of textile and apparel	(1) Wholesale of apparel
		Wholesale of food and beverages	(1) Wholesale of food and beverages (2) Wholesale of alcoholic beverages
		Wholesale of architectural materials, minerals, metal stocks and others	(1) Wholesale of architectural materials, minerals, metal stocks and others
		Wholesale of machinery and tools	(1) Wholesale of machinery and tool
		Other types of wholesale trade	(1) Other types of wholesale trade
		Retailing of various commodities	(1) Department store, Hypermarket (2) Other types of various commodities retailing
		Retailing of textile, apparel and personal belongings	(1) Retailing of women's apparel (franchise) (2) Retailing of women's apparel (non-franchise)
		Retailing of food and beverage	(1) Retailing of meals
		Retailing of machinery and tools	(1) Automotive retailing (2) Retailing of electric machinery and tools
		Other types of retail trade	(1) Home improvement retailer
L	Academic research, expertise and technical service	Expertise service	(1) Labor and Social Security Attorney office
		Technical service	(1) Architectural designing (2) Surveying (3) Other civil engineering and construction services (4) Non-destructive testing service (5) Other technical services

Large classification		Medium classification	Implemented industries
M	Accommodations, eating and drinking services	Accommodations	(1) Inn (2) Hotel
		Eating and drinking places	(1) Specialized restaurant (Japanese cuisine)
N	Daily living services, entertainment	Laundry, barber, beauty salon, bathhouse	(1) General laundry
		Other daily living services	(1) Travel agency (2) Funeral business
		Entertainment	(1) Bowling alleys (2) Workout gyms
O	Education, learning support	School education	(1) Specialized training colleges, schools for specialized education
P	Medical healthcare, welfare	Social insurance, social welfare, nursing care service	(1) Home-visit nursing care service (2) Fee-based homes for the elderly
R	Services	Waste treatment business	(1) Industrial waste treatment business
		Repairing of machinery, etc. (excluding those stated separately)	(1) Furniture repairing
		Employment referral service, worker dispatch service	(1) Employment referral service (2) Worker dispatch service
		Other service businesses	(1) Building maintenance business (2) Security service

(Source: Excerpt from the list of skill map of the Vocation Training Station Support System (TETRAS) by JEED: http://www.tetras.uitec.jeed.or.jp/ShougaiTaikei/)

(Note: The origin of quotations may change the contents and their expression without notification, now or in the future.)

3 Vocational Ability Evaluation Standards

The Vocational Ability Evaluation Standards given here are the official evaluation standards for vocational ability that form the center of "the Vocational Ability Evaluation System" in Japan. Based on the job analysis in a wide variety of industries and job categories, including cross-categorical clerical work, manufacturing, construction and service businesses, the standards cover 52 industries, 267 job categories, 616 duties and approximately 6,700 ability units (as of the end of May, 2014).

Here, an explanation is given by taking the example of "screw manufacturing industry–screw manufacturing job category" from the manufacturing industry.

3.1 Characteristics of the Vocational Ability Evaluation Standards

- In addition to the knowledge and skill/technology that should be held in order to implement work effectively and efficiently, the standards also specify the action that will result in achievements.
- The content of the work is segmented and summarized in a certain unit called "Ability Unit". By combining these ability units, it becomes possible to cope with the composition of duties in each company and a wide variety of duties for individual workers.
- The standards are set by selecting job categories and duties from the perspective of improving the competitiveness of the business world and human resources development and considering the human resources needs in the business world.
- The standards can be utilized not only for evaluating vocational ability but also as a guideline for career development and capacity building.

3.2 Composition of the Vocational Ability Evaluation Standards

- The content of work is segmented as: "Job Category" → "Duty" → "Activity". The vocational ability required for each activity is specified and is streamlined as an "Ability Unit".
- Ability unit is comprised of "Common Ability Unit" and "Selected Ability Unit".
- Ability unit is further segmented into several items called "Ability Details", and the "Standards for Job Performance" and "Required Knowledge" are specified.

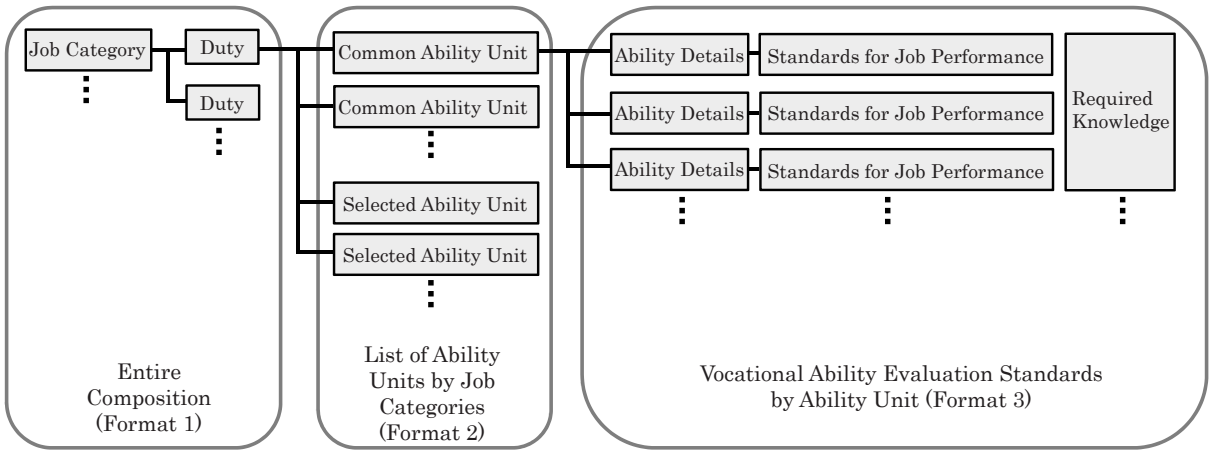


Figure 5-3-1 Composition of the Vocational Ability Evaluation Standards

3.3 Classification according to the roles and assignments

Focusing on the roles expected from the company, the staff including the newcomer, person responsible of certain work, and those at the level of division head and sector head are categorized roughly into four levels, from Level 1 (L1) to Level 4 (L4).

Table 5-3-1 Classification of Manufacturing Industry (screw manufacturing industry)

Level	Engineering	Manufacturing
Level 4 (L4)	Level of capacity necessary for assuming the leadership of an organization as a person in charge of a large organization, by setting organizational objectives and making extensive and comprehensive judgments and decisions.	Level of capacity necessary to set production plan and organizational objectives and to assume the leadership of the entire organization to achieve them as a person in charge of a large manufacturing line.
Level 3 (L3)	- Management Level of capacity necessary for creating an operational plan and implementing management operation of a mid- to small-sized organization, as a person who is responsible for such organization, based on management policy. - Specialists Level of capacity necessary for generating corporate profit through technical development or solution in the area in charge with high-level expertise.	- Management Level of capacity necessary for managing and supervising the work site as a person in charge of a mid- to small-sized manufacturing line. - Specialists Level of capacity necessary for contributing in adding high value to products by implementing precise work and solving problems with high-level skills.
Level 2 (L2)	Level of capacity necessary for implementing operation as one of the main members of a group or a team, while utilizing one's inventiveness and making autonomous judgment, improvements and suggestions.	
Level 1 (L1)	Level of capacity necessary for securely implementing formulaic operation as a person in charge, based on the instructions and advice from one's supervisors.	

3.4 List of Ability Units by Job Category

- The "List of Ability Units by Job Category" is given in order to cope with the composition of duties in each company and the difference of duties for individual workers with the combination of "Ability Units".
- The "Common Ability Units" set the vocational ability essential for implementing work, regardless of the specific content of the duties of individual workers.
- The "Selected Ability Units" set the vocational ability that differs according to the duties by the individual worker. Among them, one or more ability units are selected according to the content of the duties of individual worker.
- By combining the "Common Ability Units" and "Selected Ability Units", vocational ability evaluation standards appropriate for the content of the duties of individual workers can be made.

[Example of job category related to manufacturing industry, "screw manufacturing"]

Job Category	Screw manufacturing
Job Description	Manufacturing of screws in the screw manufacturing industry. It is categorized into three job categories, namely flatting/former, rolling/tapping, and secondary processing cutting.

Table 5-3-2 Common Ability Units

Duty	Name of Ability Unit	Level 1	Level 2	Level 3		Level 4
				Specialist	Manager	
Common to all duties	Complying with safety, health and other rules	47C014L11	47C015L22	47C016L34		
	Problem solving through improvement activities	47C017L11	47C018L22	47C019L34		
	Implementation of operation through collaboration with concerned personnel	47C020L11	47C021L22	47C022L34		
	Improvement and inheritance of skills			47C023L33	—	
	Manufacturing management					47C024L44

3.5 Vocational Ability Evaluation Standards by Ability Unit

- "Vocational Ability Evaluation Standards by Ability Unit" are comprised of several "Ability Details". They are basically set in line with the plan-do-see work cycle.
- The "Standards for Job Performance" are set for each ability detail.
- The "Standards for Job Performance" include competency in addition to skills and technology. They are listed as some typical examples of job behavior that can work as criteria for evaluation.
- The "Required Knowledge" is listed items that should be understood as a premise for job performance.

Table 5-3-3 Example of Unit No. 47S044L22

Level 1	Level 2	Level 3		Level 4
		Specialist	Manager	

Unit No. 47S044L22

Selected Ability Unit	Ability Unit	Rolling
	Outline	Ability to implement the rolling and casting of screw part

Ability Details	Standards for Job Performance
(1) Rolling work planning	○ In order to prevent reproduction in cases where there is waste due to excessive production or a lack of production, the quantity of production, scheduled time and quantity of materials used (weight or numbers). ○ The performance, specification and handling method of a mold for rolling, rolling processer and other facilities used are confirmed. ○ A mold for rolling is prepared and attached appropriately to rolling processer. ○ The mold is checked for galling, rough surface, or cracks before it is attached, and test processing is implemented. ○ Instructions on rolling work are given to colleagues and junior staff.
(2) Rolling work implementation	○ Conditions of rolling machinery and ancillary machinery are set according to the use of the product. ○ High-precision rolling work is implemented whilst adjusting the parameters for the mold in order to ensure the correct dimensions of the processed product. ○ Blanks are set adequately in mold. ○ Even small anomalies in rolling machinery and ancillary machinery are not overlooked, and measures are taken to prevent malfunctioning and trouble. ○ Rolling machinery, ancillary machinery and molds are inspected after finishing the work. ○ The efficiency of processing work is improved by organizing, streamlining, cleaning, sanitizing and ensuring discipline on the work site of the rolling work.
(3) Work evaluation	○ Adjustment and maintenance of molds used for rolling machinery and ancillary machinery are implemented correctly and promptly. ○ Early breakage, galling, defects in the dimensions and surface of products are closely checked, and any uncertainties are confirmed with the supervisor. ○ Any defective products and facility trouble are confirmed with the situation and cause and reported to one's supervisor, and adequate measures are taken.

●Required Knowledge

1. Rolling process in general
- Types and characteristics of rolling process

2. Materials
- Types, property and use of metal materials
- Types of defects of metal materials
- Material Testing

3. Rolling method
- Types, structure and use of rolling machinery and ancillary machinery
- Types and use of jigs and tools used for rolling process
- Rolling method
- Cause of defects caused in rolling processed products and prevention method

4. Machine Oil
- Use of lubricant oil, hydraulic actuation oil, grease and processing oil agent
- Degradation, replacement, disposal

5. Method of processing with machinery
- Types and use of machine tools
- Hand-finishing and other processing method

6. Graphic method and material symbols set by JIS

7. Electricity
- Electricity terms and how to use electric machinery and tools

8. Relevant laws and regulations
- Relevant laws related to Basic Environment Act

9. Safety and Sanitary
- Detailed knowledge on safety and sanitary

Vocational Training Instructors Manual for ASEAN Development Committee

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