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.

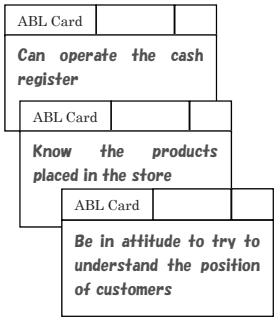


Figure 3-1 ABL Cards

● 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.

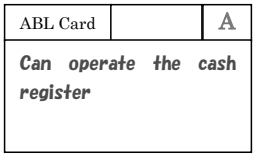


Figure 3-2 ABL Card (importance level)

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.

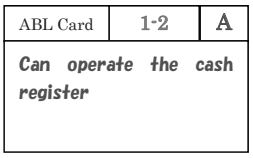


Figure 3-3 ABL Card (card number)

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

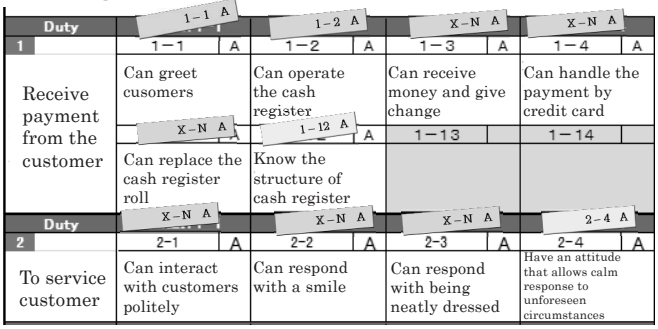
After the completion of a job analysis chart, a structured chart of abilities and qualifications is made based on it.

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.

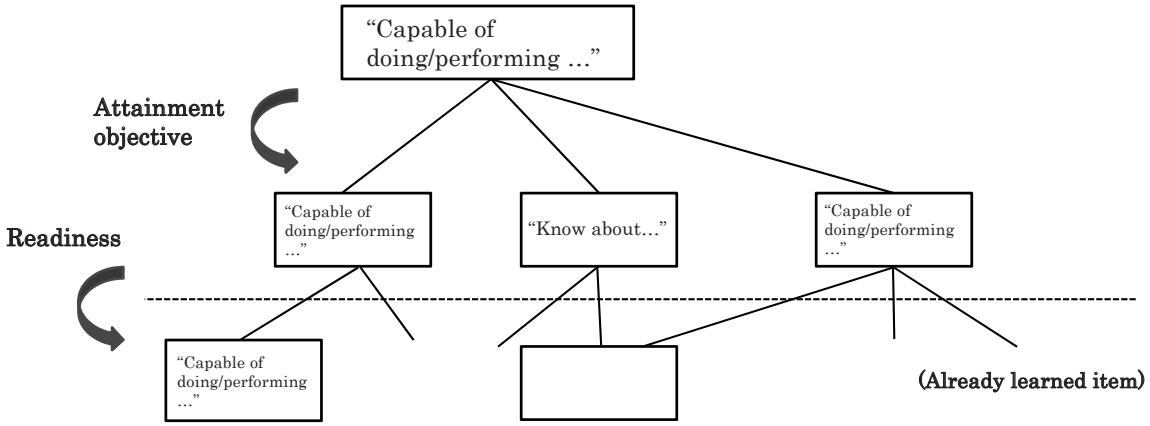


Figure 3-4 Schematic Representation of Target Analysis Chart

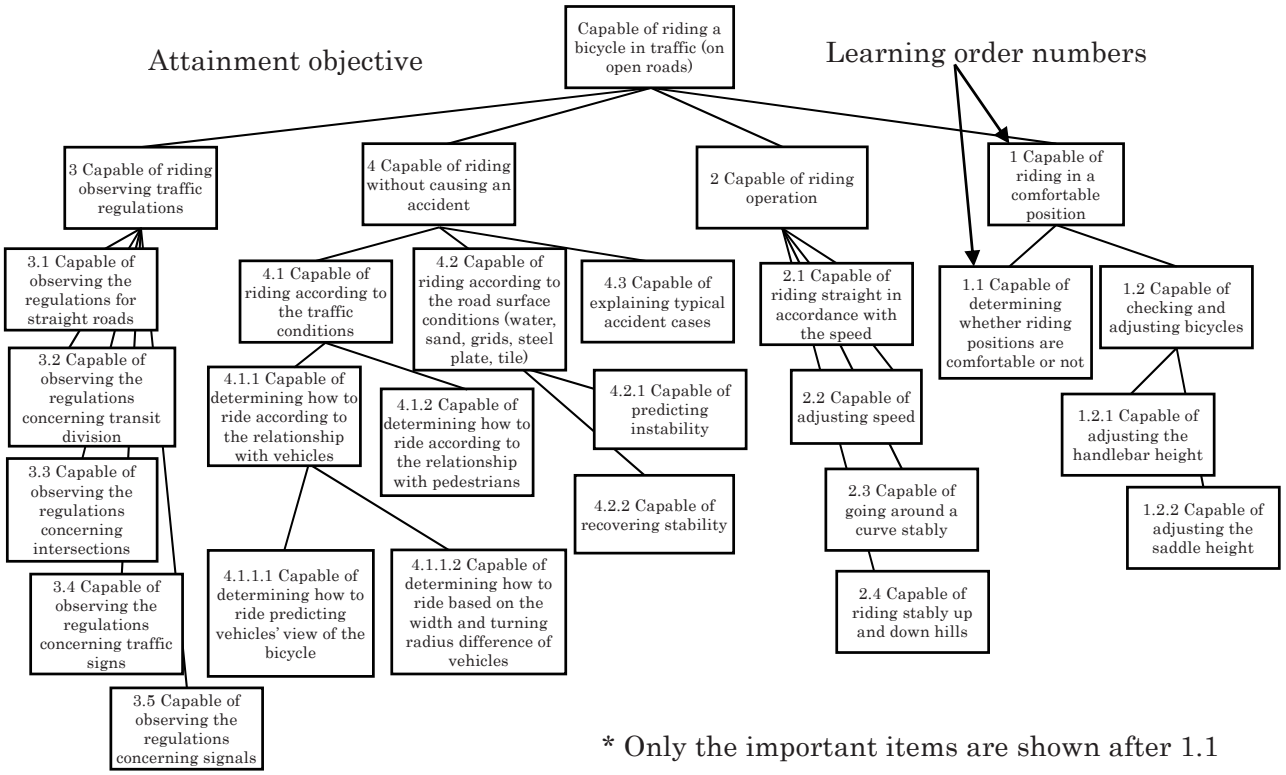


Figure 3-5 Target Analysis Chart and Description of Learning Order Numbers

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

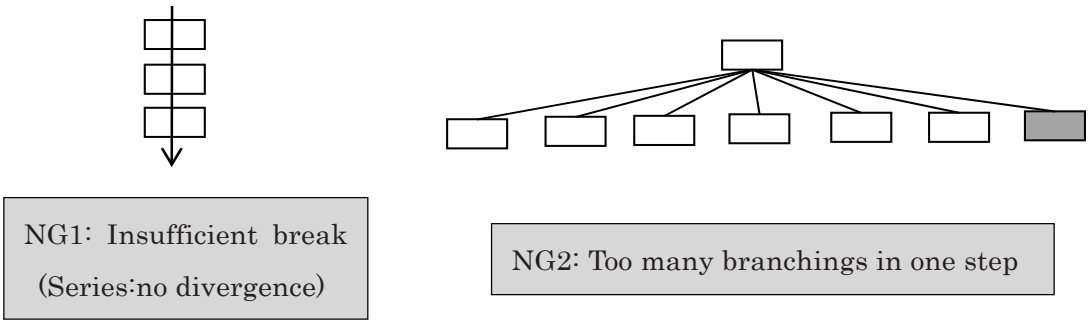


Figure 3-6 Inadequate Break Down Example of Attainment Objective

(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 [ ].

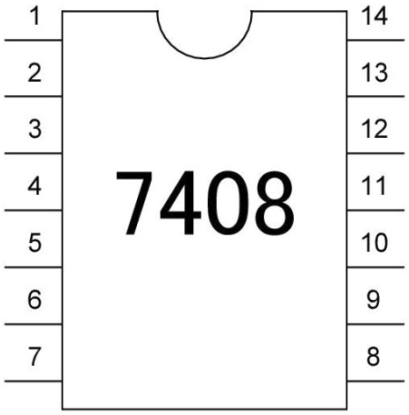
Later, the Internet was formed through the interconnection of networks using the [ ] technology. Numbers called [ ] are assigned to equipment connected to the Internet. Because these numbers are difficult to memorize for humans, they are converted to names (combination of host name and domain name) using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

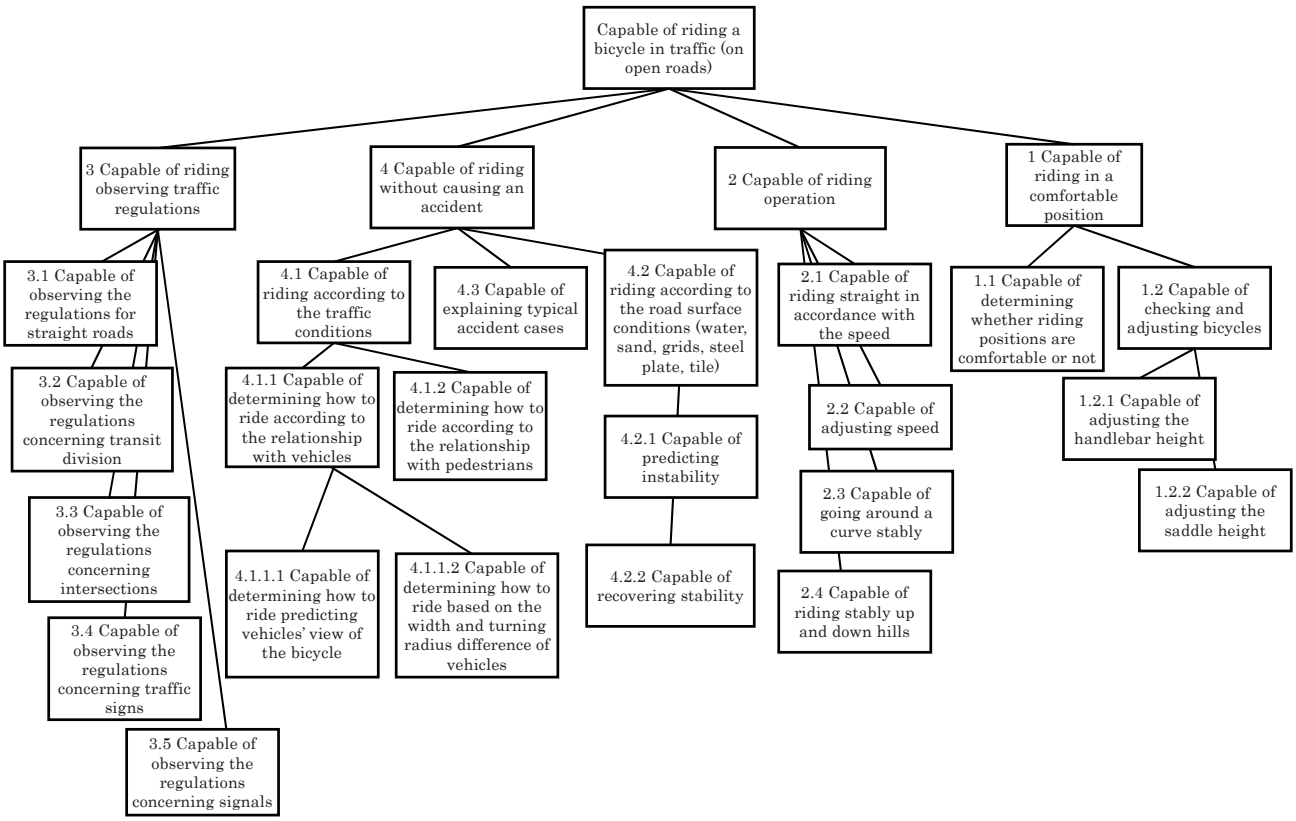


Figure 3-8 Structure of the Ability Elements to Ride a Bicycle

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

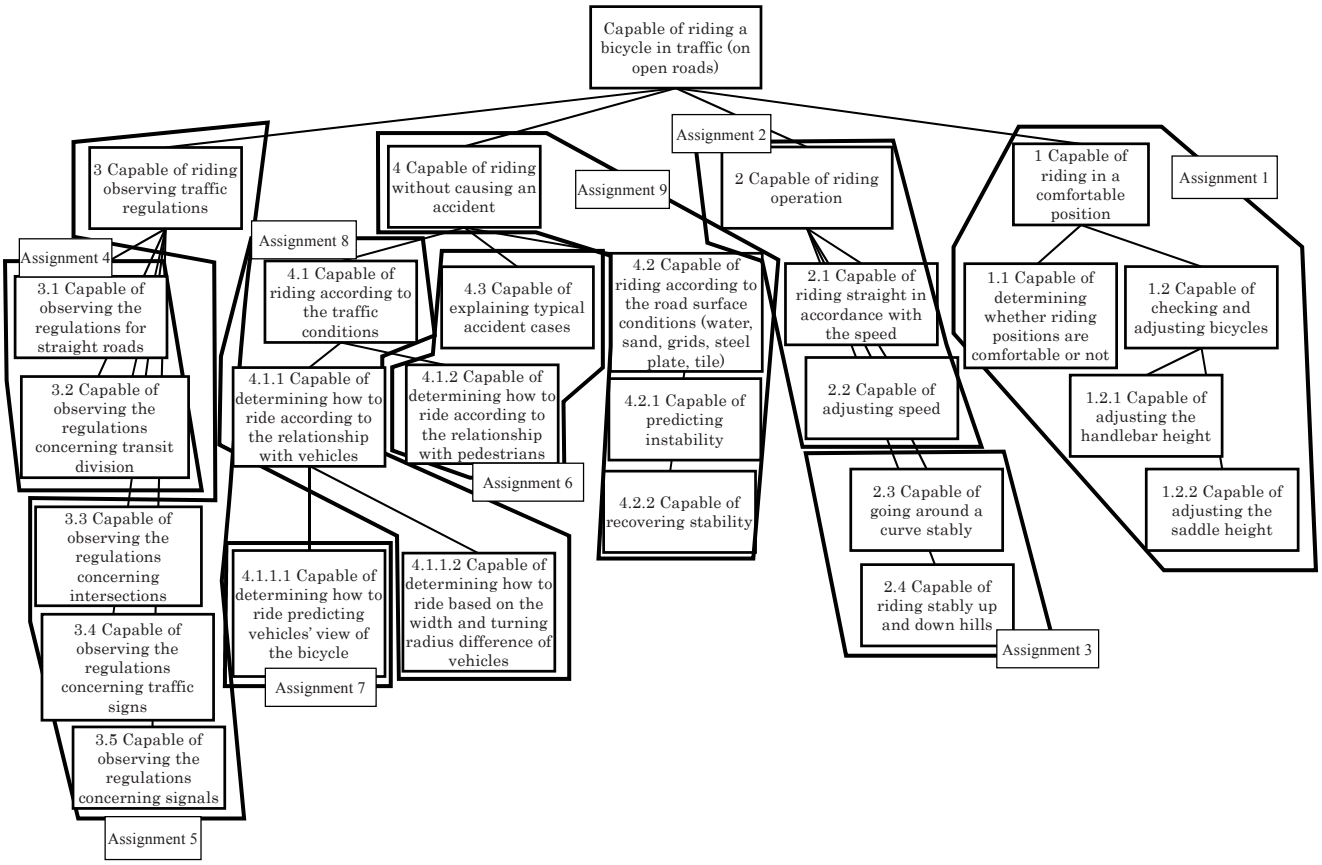


Figure 3-9 Example of the Structure of Training Assignments for Instruction of Bicycle Riding

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.

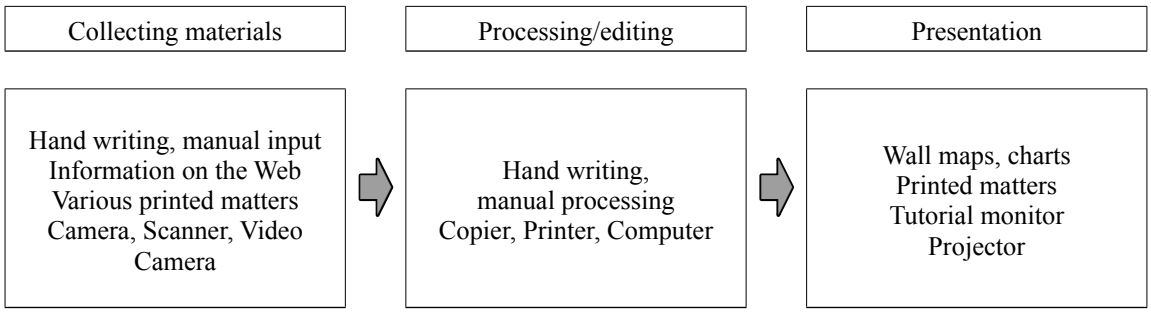


Figure 3-10 Audiovisual Aids Easily Available in Recent Years

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

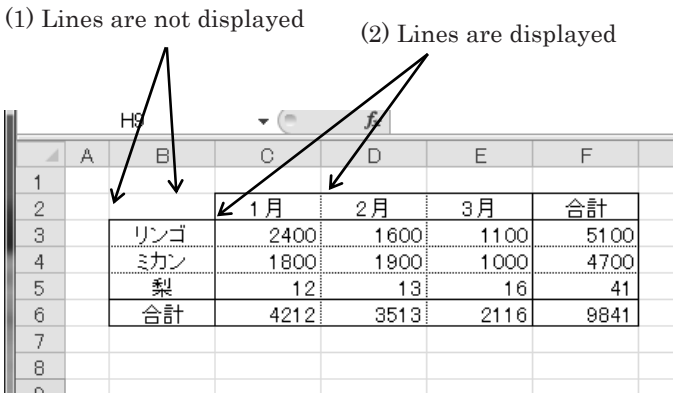
the outline of each item, and place illustrations on the left and explanations on the right and give hints, etc.

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.

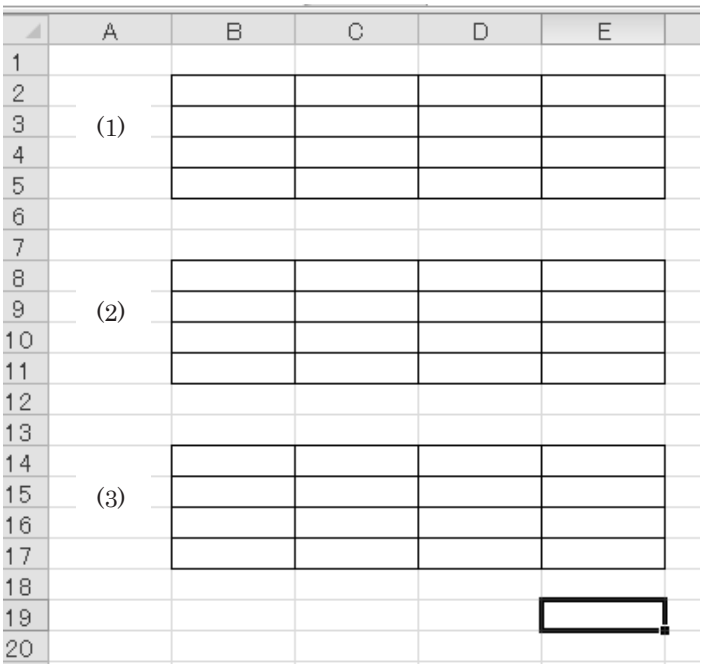
Design the assignment contents to enable the practicing necessary to achieve the attainment objective set for the lesson. It is not necessary to give a detailed description of the procedure of the work provided in a textbook, etc. but rather to clearly demonstrate the procedure of the practice.

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.

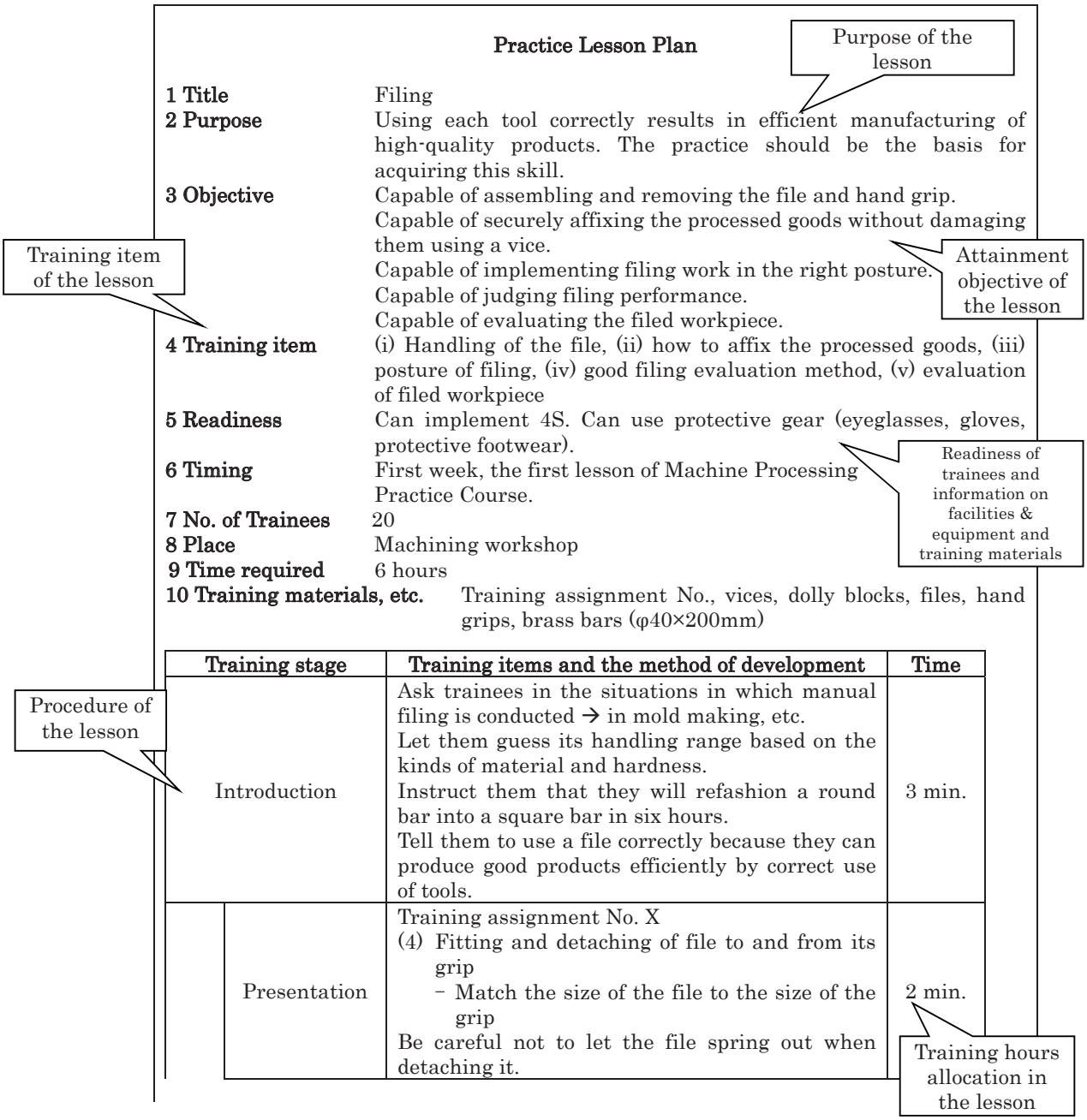


Figure 3-13 Six Items Shown in the Lesson Plan

(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.

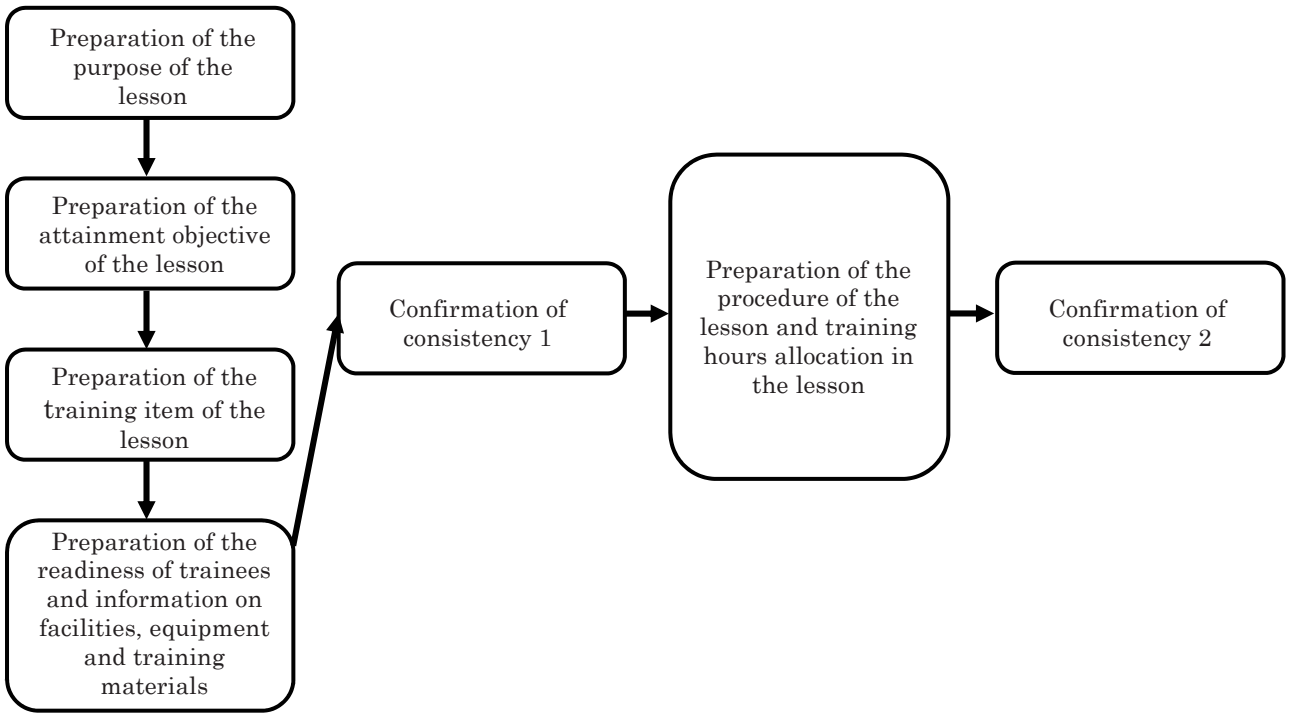


Figure 3-14 Procedures for Preparing a Class Plan

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.)

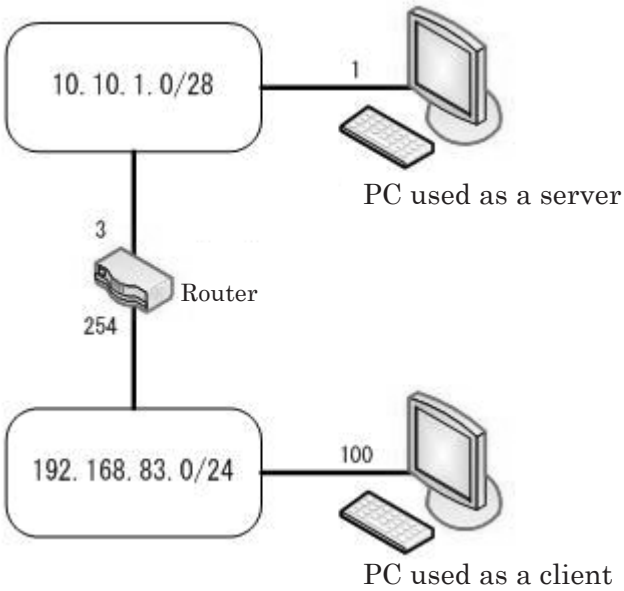


Figure 3-15 Network Connecting Diagram

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.

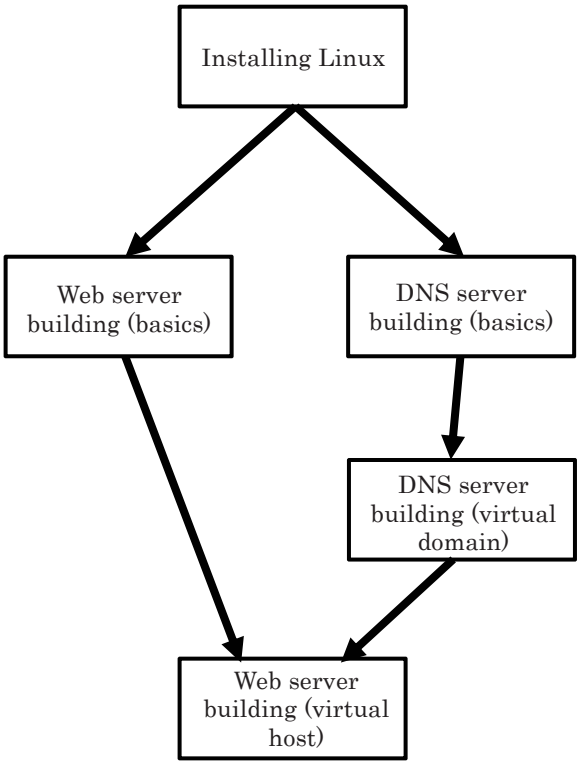


Figure 3-16 VT Courses Implemented Before the Training Assignment and Their Order

(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.

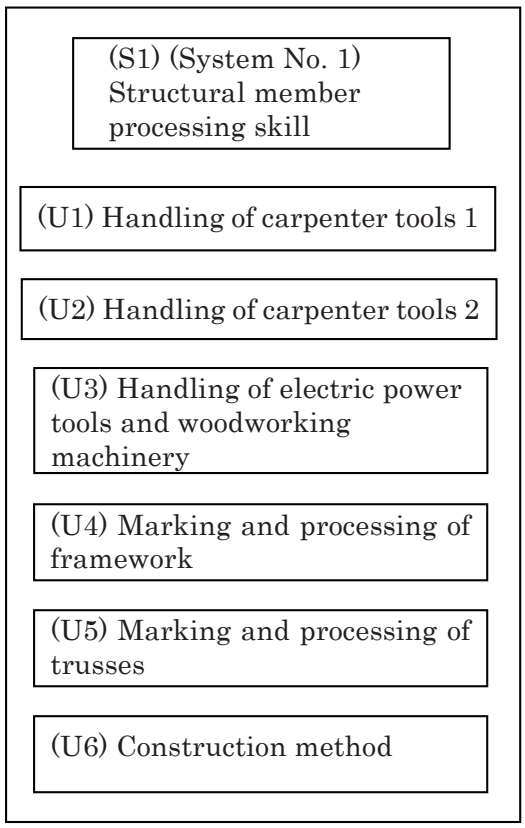
The VT instructor will participate in the team in roles such as trainee’s supervisor or client, and will control the project planned by the trainee, so that it can be finished without problems.

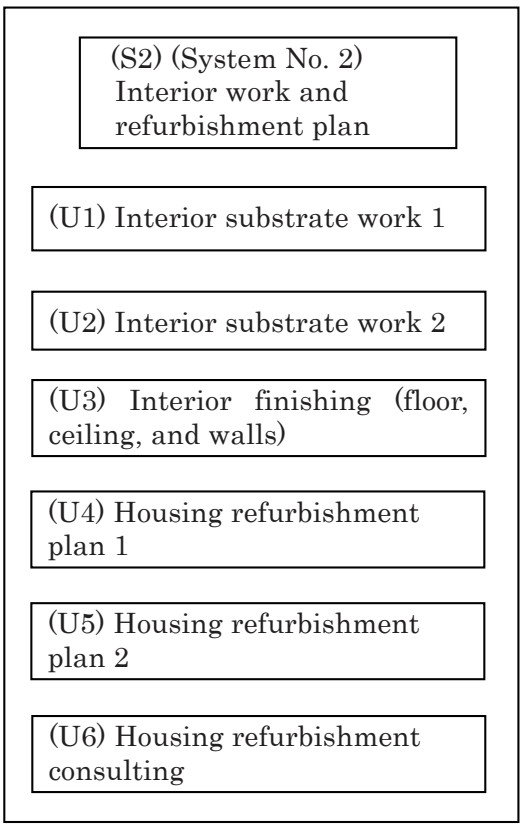
3.8.3 Case examples of assignments and training materials

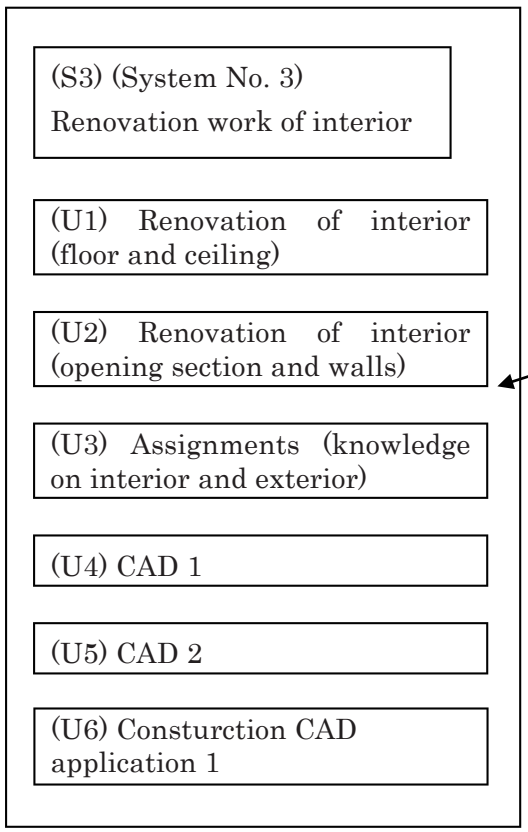
(1) Example of making up assignments

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.

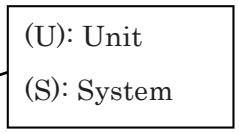
Table 3-23 Example of Breakdown of System Unit Training
(training plan related to construction of the structure of housing and interior finish work for three months)







(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.

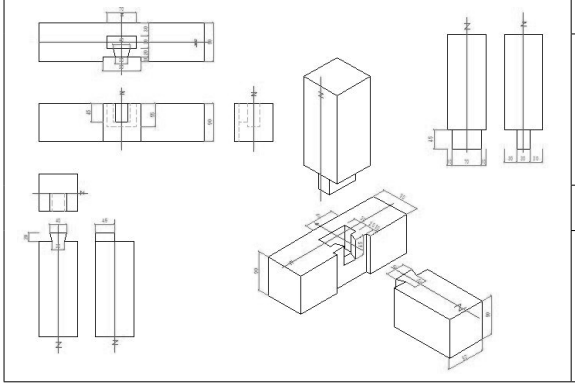
Marking of the framework	
	Assignment 01
	Mark and process the wood (105 × 105 × 4m) for half-lap dovetail joints.
	Assignment 02
	Mark and process the wood (105 × 105 × 4m) for dovetail dado joints.

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.

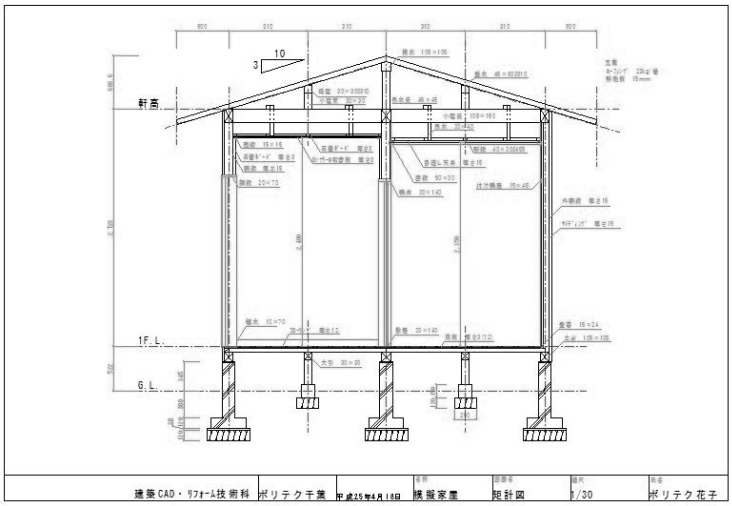


Figure 3-20 Mock House Drawing

(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

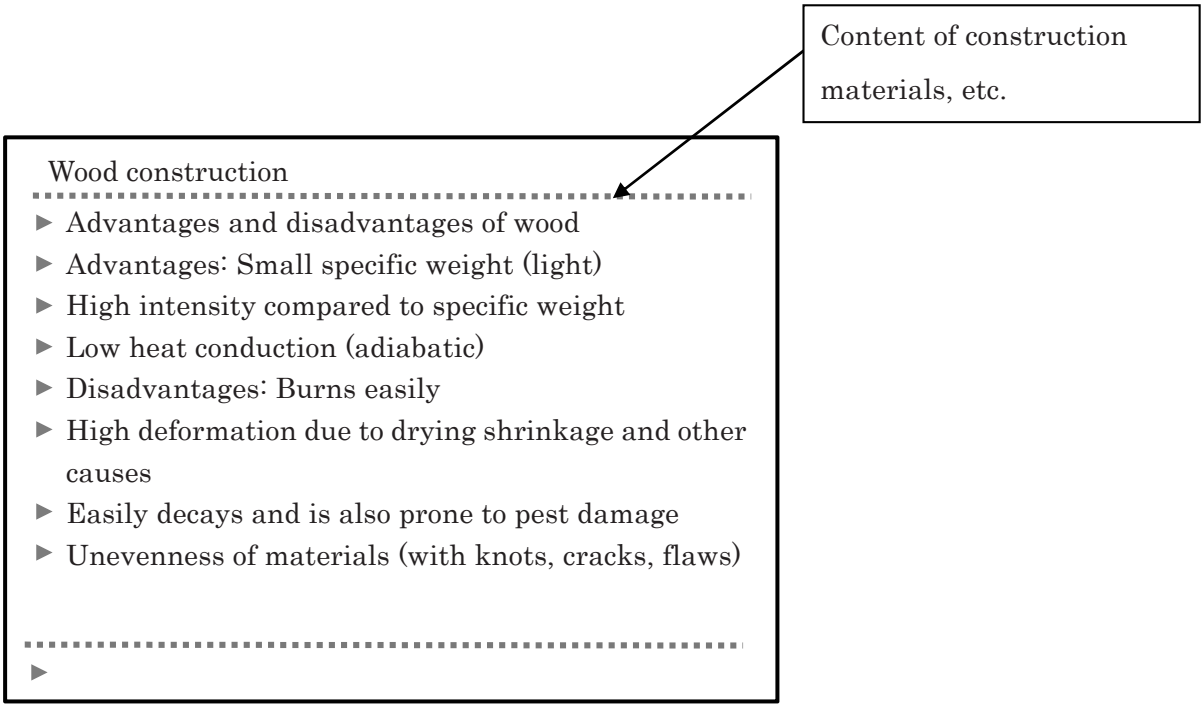
Preparation for work	1. Move out the furniture and other movable objects from the room before the work. 2. Items that can't be moved out should be covered with plastic sheets. 3. Also apply plastic sheet to the floor.
Substrate treatment	4. If the surface is not covered by wallpaper, apply substrate 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

Unit
Handling electric power tools and woodworking machinery

No	Date	Day of the week	Details	Person in charge	
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)

Person in charge

Unit
CAD

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

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.