

## **How Do I Plan the Allocation of Rooms and Timetables?**



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# How Do I Plan the Allocation of Rooms and Timetables?

von/by

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# 1. What measures can be taken to create a useful starting point?

## 1.1 Introduction

### *PRELIMINARY REMARKS*

1.1.1 The trainee or apprentice is at the centre of all vocational training measures. All educational efforts, all educational measures and all the actions taken by those responsible for the training centre must have the objective of understanding the individual structure of every student and of allowing his strengths and the possibilities within him to develop freely. This is also done in the service of the economy, the state and society.

In order to be able to achieve this high aim, at least in part, various conditions must be fulfilled:

1. Schools and industry must ensure that the trainee attends the correct school and is given the correct course of training, in accordance with his individual disposition. This is achieved by guidance and aptitude tests.
2. Social barriers on the route to developing individual gifted persons must be broken down as far as possible by government bodies.
3. Last but not least, the future requirements of society for a workforce with specific training must also be considered; it is important to coordinate the demands raised by developments in society as a whole with the wishes and expectations of the individual. Promotion and selection are two, equally important, mutually interactive principles. Highly technical societies cannot do without the elite element embodied in the principles of achievement, nor can they neglect education of the masses.

International comparisons are important instruments in the educational policy of all civilized countries. They allow mutual stimulation, particularly as important questions regarding the further development of systems of education are being raised in practically every country, despite differences in the point of departure, at the same time as technical developments are going on world-wide. The glimpse beyond one's boundaries is thus useful and necessary.

The Federal Republic of Germany has promoted international comparative studies for a considerable time, and supports their effectiveness by issuing invitations to experts from many partner countries.

Far in excess of 50,000 specialists and executives have so far been invited within the scope of study programmes to share their experience and to undergo training and advanced training. In doing so, the Federal Republic of Germany is strictly guided by the needs and wishes of the countries of origin of those invited.

Our seminar is a small excerpt from the wide variety of programmes held in the service of international cooperation and development.

Irrespective of prevailing national systems of education, the field of further vocational training in particular frequently displays unexpected parallels in the conditions, problems and requirements exhibited by individual training centres. The least suited for comparison is perhaps the student himself, because he is shaped by sometimes very different cultural and educational influences.

Similarly, teachers are subject to contrary influences although there is surely a consensus of agreement throughout the world that their effectiveness can be measured in terms of their technical and pedagogic qualities; the same importance is attached to technical and educational content throughout the world.

The situation is similar when we consider buildings and equipment. Certainly, different climates require different forms of construction, whereas the mechanical equipment, the tools required and the materials stored in, for example, a metal-work training workshop, may be identical in every corner of the world.

Absolute unison no doubt prevails in the administration and organization of a technical training centre, if we disregard insignificant local appearances.

### *FUNDAMENTALS OF PLANNING*

Planning timetables and the allocation of rooms forms an essential foundation for the entire organization of every technical school from the North to the South pole.

A proposal of how to undertake such planning will be made step by step below.

Every person with responsibility in a training centre should be capable of checking and controlling the organizational sequence of training.

One essential foundation for functioning without a hitch is proper planning with respect to timetables and the allocation of rooms. Every planner must first familiarize himself with the fundamental target data.

Realization of what is to form the foundation for planning must stem from practical experience.

It must not be forgotten that a country's industrial development is closely linked with vocational education, and that considerations of individual starting conditions or qualitative and quantitative needs analyses on the spot are decisive for choosing one or several areas of specialization.

Once the special areas in which training is to be given have been clarified, the next step is to draw up a time schedule with training capacity.

Room requirements can now be determined.

The final stage is the schedule of classes, which completes the planning documents.

This ultimately allows rooms to be allocated and a timetable to be drawn up.

This can best be made clear by way of a model example.

### **1.1.2 Areas of specialization**

#### *AREAS OF SPECIALIZATION*

According to the German Vocational Training Act, the concept of "vocational education" combines three main sub-areas:

1. The object of initial training shall be to provide, through a systematic training programme, a broadly conceived basic preparation for an occupation and the necessary technical abilities and knowledge to engage in a skilled form of occupational activity. It must be organized as clearly as possible, and must be accommodated within an appropriate framework with respect to syllabus and timetable.

2. Further training shall be designed to enable a trainee to maintain or extend his vocational knowledge and abilities, adapt himself to technical development or obtain promotion in his chosen occupation. It is thus conditional on technical knowledge and skills gained in a course of training previously completed: e.g. training as a skilled worker followed by further training as a technician or advanced training as a master craftsman.

Initial vocational training in particular, but in industrially emergent countries more particularly further vocational training and vocational retraining form the prerequisites for further technical development in the economies of these countries; in the past three decades, therefore, new initial and further vocational training establishments have been set up throughout the world, those already in existence expanded and enlarged, and governments have also promoted the running of such institutions by appropriate measures.

Growing industrialization has led to a continual increase in the importance of vocational education in general, because it has gone hand-in-hand with an increasing need for an appropriately trained workforce in newly created industries.

Systems of vocational education have in the meantime attained a certain level in all countries, attempting to satisfy regional demands.

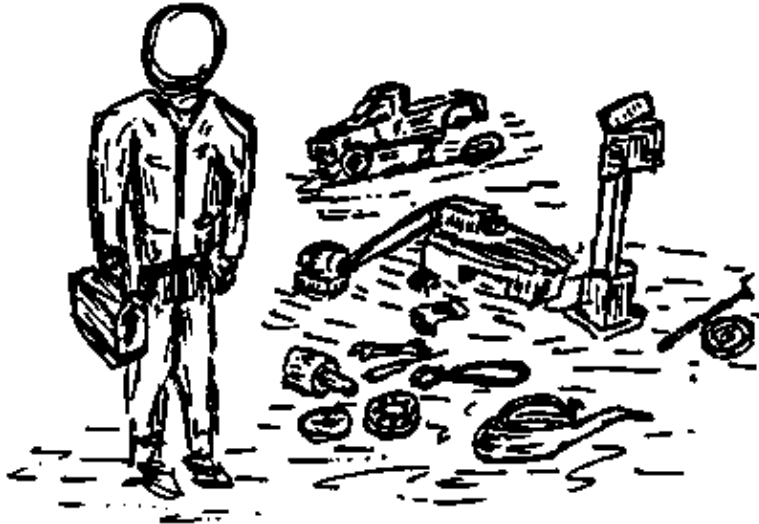
In many or most cases, the development of vocational education is supported and promoted by the highly developed countries.

An extremely large part of industrial installations consists of machine tools, mechanical conveyor equipment, supply facilities, machinery and equipment for building and civil engineering, and motor or power engines.

The profitability of firms and companies is dependent on such equipment remaining in perfect working order.

There is still a general basic lack at present in the sector of trained personnel capable of maintaining and keeping such industrial equipment in good working order.

These are the maintenance and repair fitters trained for various sectors of industry.



### 1.1.3 Time schedule and student numbers

#### *PRECONDITIONS FOR TRAINING*

In the context of the considerations made above, an outline will be given below of the preconditions for training in this specific area, and these conditions clarified with the aid of a model example.

A very urgent need for repair and maintenance staff arises not only in highly industrialized countries, but precisely in the case of newly industrializing countries, where vocational education is also in its infancy, where a reservoir of personnel with general skills must first be created, and where customer service cannot be organized by the firms supplying the equipment. Dependence on foreign experts and fitters is uneconomical in the long run, and there is no doubt considerable interest everywhere in becoming largely independent of outside assistance by employing the local workforce. The current situation in Saudi Arabia is admittedly a special case in many ways; it is nevertheless extremely typical and informative.

#### *MAINTENANCE AND REPAIR SECTORS*

An industrial complex requires trained repair and maintenance experts for, e.g.:

- process engineering;
- heavy machinery and diesel engines;
- production machines and plant equipment;
- electrical installations;
- power equipment and systems;
- electronic installations.

The know-how and ability required by such maintenance and repair experts presupposes a system of training characterized by specific

- prior knowledge;
- duration;

- subject matter.

General experience provides us with the following significant data:

- a training group should contain a maximum of 30 participants within the framework of theoretical training, and a maximum of 15 participants within the framework of practical technical training;
- periods of training completed in industrial countries, incorporated into the system of general schooling;
- climatic conditions, above all during periods without training (for example, holidays,...).

These facts from general experience are largely based on conditions in the Federal Republic of Germany. It nevertheless proves possible to transfer them to the overall field of vocational education throughout the world without any great difficulty. Special features specific to particular countries may make minimal changes necessary in one case or another, but this does not affect the overall concept.

#### *MODEL EXAMPLE*

Our model example produced the following data:

- a duration of training lasting a total of three years, broken down into a basic stage and two advanced, technical stages, each individual stage being subdivided into two semesters;
- a change of stages annually;
- a total of 44 weeks per year, each with 40 hours per week, gives 1,760 training hours per year;
- an annual intake of 30 new participants per special area ultimately results in a total of 450 participants, with 90 participants in each special area.

#### **1.1.4 Room requirements**

##### *UTILIZATION CRITERIA*

Our preliminary considerations have already clearly revealed that the building complex in a training centre is one of four fundamental factors of training as a whole, and one which has a decisive influence on the quality of training courses. This applies most particularly to a technical training centre, in which essential practical elements have a significant role to play and the building must provide workshops and laboratories to teach such practical elements.

Thus, for example, the planning of rooms and space in a vocational training centre must make a basic distinction between room facilities for theoretical instruction (classrooms) and such for practical training and exercises (workshops and laboratories).

The percentage of time spent on training in theoretical and practical classes largely governs the planning of rooms and space. It also differs according to subject.

Nevertheless, it is also necessary to consider all sorts of auxiliary rooms required in a training complex.

Our example case produced the following data:

16 rooms, each of	20 m <sup>2</sup>
10 rooms, each of	25 m <sup>2</sup>
1 room of	60 m <sup>2</sup>
4 rooms, each of	80 m <sup>2</sup>

18 rooms, each of	100 m <sup>2</sup>
5 rooms, each of	144 m <sup>2</sup>
1 room of	160 m <sup>2</sup>
22 rooms, each of	200 m <sup>2</sup>
1 room of	320 m <sup>2</sup>
Total room area	8,350 m <sup>2</sup>

This does not take account of:

- administration;
- sanitary facilities;
- recreation area;
- power supply.

### 1.1.5 Schedule of classes

#### *SCHEDULE OF CLASSES, ALLOCATION OF ROOMS, TEACHING STAFF*

The target contents and the goals of practical training determine the selection of the individual subjects to be taught and their time weighting.

The distribution of subjects over individual stages of training and the time spent on these subjects must be kept flexible, and depends on subgoals and on the concentration of teaching, taking account of basic pedagogical and didactic principles.

There is a direct relationship between the schedule of classes, the allocation of rooms and teaching staff.

The central point is formed by the training group. In order to achieve the goal of training, each individual time unit requires both a room and a teacher. This leads to the inseparable interweaving of times, rooms, and persons when planning teaching.

#### *MODEL EXAMPLE*

On the basis of sound experience, the distribution in our model example is as follows:

	General education sector	Applications-oriented scientific sector	Technological sector
Basic Stage			
Theory	220 h	308 h	220 h
Practice	44 h	44 h	929 h
Advanced Stage I			
Theory	176 h	440 h	220 h
Practice	88 h	176 h	660 h
Advanced Stage II			
Theory	264 h	484 h	308 h
Practice	44 h	44 h	616 h

### 1.1.6 Meaning of basic terminology

#### *EXPLANATION OF TERMS*

For the purposes of communication between instructor and participants in the seminar, it would appear essential at this stage to define clearly the meaning of a number of special terms and expressions.

It may be left to the discretion of the person responsible for running the seminar to select certain concepts and expressions from the following list, or indeed to supplement this list wherever necessary. This will depend on how far these matters are familiar to participants.

Of course, such a section entitled "explanation of terms" cannot eradicate every difficulty with respect to the denotation of such words and expressions; on the contrary, it is the duty of the person running the seminar to check throughout its duration how far the special expressions used and the participants' understanding of their meaning correspond.

#### I. Pedagogy, Methodology, Didactics

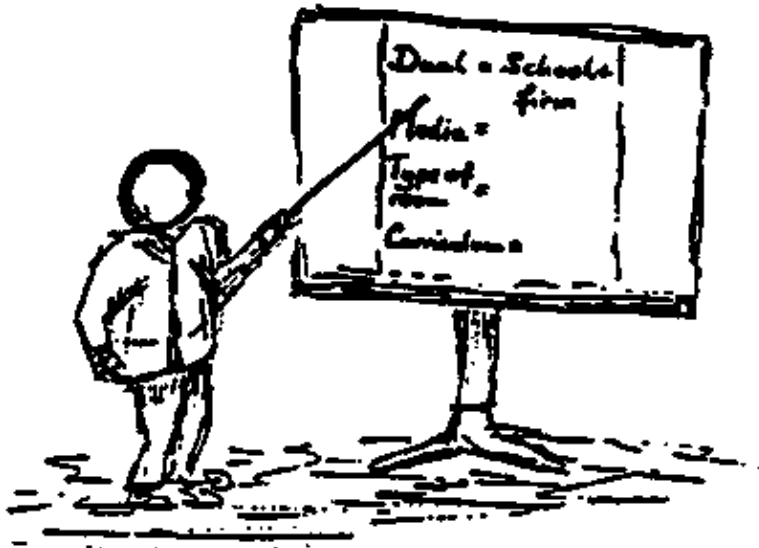
<u>Matrix</u>	Arrangement of linguistic elements by features in a diagram consisting of rows and columns
<u>Know-how</u>	Experiencing by means of information, being conscious or aware of something
Insight	First confrontation with a field of know-how
Overview	Intellectual ability to see a thing/development/area in context
Knowledge, experience	Total know-how in any one area
Familiarity	Being experienced, knowing something closely
<u>Ability</u>	Capacity to perform, acquired by learning and practising, skillfulness
Capability	Being able to perform something (talent, gift, know-how, ability, "conscientiousness")
Skill	Dexterity achieved by practice; skillfulness in performing certain tasks
Mastery	Skill in handling something correctly; being informed, able
<u>Recognition</u>	Perceiving clearly, seeing, discriminating, discerning something
Awareness	Knowledge of a matter or a process
Appreciation	Cognizance, realization, expertise
Understanding	Grasping the sense of something, empathy
Evaluation	Judging, observing, assessing some thing or some action
Openness	Honesty, genuine nature
Inclination	Preference for something
Interest	Attention, notice, consideration, curiosity, commitment
Respect	Estimation, esteem
Readiness	Willingness
Decisiveness	Vigour, energy
Media, teaching aids	Resources for the purpose of information, teaching (paper, textbook, sound carriers, film, television, educational equipment and materials, etc.)
Attitude	System of views, opinions and convictions held by a person as a result of experience
Information	Particulars, news, enlightenment, advice, education by instruction
	Number of teaching weeks in a calendar year

Annual weeks, weeks per year

Operation Act, activity, method verifiable scientifically according to certain rules

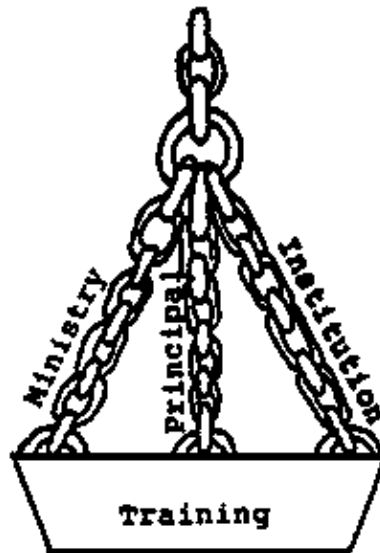
## II. School Organization

Specialized vocational school	Full-time vocational school in the form of a one- to three-year course of training
Vocational school	School for the further education of young people and adults in full-time, part-time or block teaching or courses
Block teaching	Organization of teaching according to aspects going beyond one subject; periods grouped together for training modules
Area of specialization	Special branch within a subject area
Technical college, specialized technical school	Vocational training school at which attendance is voluntary; offers the opportunity to attend continuing education and to acquire special qualifications (e.g. master's examination) after concluding practical training in an occupation
The industrial/ technical sector	Teaching of the theoretical contents and general subject matter relating to vocational training in the crafts and industry
The domestic science sector	Training courses and educational facilities for domestic science at vocational schools
The agricultural sector	Training courses and educational facilities for agriculture at vocational schools
Teaching staff	All teachers at a school
Teaching materials	Those aids to teaching used by a teacher in class
Curriculum	Directives, giving proposals for/prescribing educational objectives, the selection and allocation of subject matter to specific year-groups, and teaching methods
Learning/study materials	Aids for the learner (textbooks, exercise books, appliances, etc.)
Practical technical instruction	Demonstration, experimental and practical courses and classes in subjects taken from practical training
Educational sector	Grouping together of individual subjects on the basis of their close relationship to each other
Schedule of subject matter, syllabus	Schedule distributing the subject matter to be taught over one lesson, teaching unit for a specific subject, or training course as part of the teacher's preparation
Timetable	Distribution, sequence of lessons or classes
Schedule of classes, wall chart	Means employed by principals to represent organization of the sequence of training by lessons, rooms and staff
Part-time education	Opposite of full-time education; in the dual system, in particular, refers to the split into phases of in-firm and in-school training
Teaching unit	1. Time unit set for teaching a certain subject matter 2. Sequence of lessons forming a sometimes interdisciplinary unit in terms of material, didactic theory and methodology
Concentrated teaching	Treatment of the same object/topic in various subjects at the same time, e.g. from different standpoints
Teaching schedule	Plan of teaching by the teacher
Full-time teaching	System in which pupils/students are fully occupied by classes and homework. In full-time technical schools (e.g. specialized vocational schools) this means theoretical and practical training at school



### III. Training

Instructor	1. Person who trains, teaches, instructs, educates others 2. Person who instructs trainees and apprentices
Completion of training	Conclusion of a full course of training with or without a final examination or certificate
Section of training	Complete portion of A full course of training
Sector of training	Sub-area of a full course of training which forms a whole in terms of subject matter and methodology, e.g., theoretical teaching, practical technical instruction, practical training
Trainee occupation	Occupation for which ordered and uniform vocational training is stipulated by law in training directives
Level of training	Each section of training in the case of progressive training stages (e.g. basic stage, advanced technical stage) or training courses (e.g. skilled worker, technician, engineer)
Training group	Group of students, completing a section of training together
Training capacity	Quantitative (and qualitative) capability of a training establishment, above all in terms of student numbers
Training module	Section of training complete in itself, independent of other portions of training
Training curriculum, plan of training	Directives giving proposals for prescribing the goals of training, the selection and allocation of subject matter to specific year-groups, and training methods
Training system	A framework for training, generally stipulated by law, determining materials, technical and spatial training elements (e.g. dual system – technical college system)
Body providing for training, agency in charge	Person, agency or institution bearing the overall responsibility for organization and finance



Training cycle	Succession of sections of training
Trainee	Person undergoing vocational training, further training or retraining (previously known as apprentices, beginners, probationers)
Room allocation schedule	Part of school organization (schedule of classes), planning the extent to which schoolroom facilities employed for training are utilized
Occupational description	Description of an occupation, its associated training opportunities and prospects, together with the skills required beforehand and those acquired by way of the occupation, e.g. within the scope of training directives (legal prescription of training in a recognized trainee occupation)
Occupational field	Collective term for occupations with the same foundations in terms of working technique and materials (e.g. metalworking, building, etc.)
Occupational group	Group of occupations with similar characteristic activity; unit of classification within occupational system
Dual	Forming a duality, corresponding each to the other; dual system of vocational training: interactive execution of a course of training, shared between a school and a firm
Skilled worker, craftsman	Employee having completed an apprenticeship in a government-recognized trainee occupation
Further education/training	Supplementing, perfecting existing level of education/training
Training by stages	Training of apprentices in which the period of training is divided up into a succession of stages complete in themselves
Continuing education/training	Improving level of training, perfecting level of education beyond a certain level of training already completed

IV. Miscellaneous

Chambers	Representation of occupational groups in the form of a public-law institution: e.g. Chambers of Crafts, Chambers of Industry and Commerce
Organization resources	All aids to simplifying the planning of organization in a firm or a school, such as files, wall charts, card index systems, computers, etc.
Planning factors	All essential points contained in a plan or schedule
Room type	Groups of rooms for similar purpose and with similar equipment

Situational report	An analytical report based on predetermined criteria as a basis for decisions and planning
Maintenance	Constant check that machines and installations are in good working order, and correction of faults and defects as soon as these are detected – upkeep, care

## 1.2 Introductions and Objectives

### *GETTING TO KNOW EACH OTHER*

The group of participants in this seminar will only meet for a relatively restricted period of working together. Everyone is at first a complete stranger to his neighbour, and that means that he/she is "shut-in" in the truest sense of the word.

However, as the seminar is not intended to be a lecture with a one-way flow of information, but rather a genuine form of teamwork, it is essential to achieve a mutual opening-up of participants amongst themselves, and in particular between participants and instructor. The success of the seminar is to a not inconsiderable extent dependent on how far this opening-up is achieved. The more familiar and closer the partners are to each other, the better the group atmosphere generally becomes, and the quicker the desired results are produced in discourse.

In this special case, the difficulties are quite obvious and two circumstances in particular aggravate the situation.

On the one hand, participants in this seminar stem from widely different regions of the globe with a wide variety of basic ethnic, religious and cultural structures; on the other hand, there will inevitably be difficulties in the field of language, which can lead to delays in the seminar's progress.

It is therefore all the more essential at the beginning of the seminar to create a common working basis as quickly as possible.

In view of the extremely short period of time available for this purpose, personal presentations form a first, decisive step. The problem should nevertheless be borne in mind for the entire duration of the seminar.



### 1.2.1 Personal presentation by instructor/teacher

It is one of the most important tasks of the instructor to develop a personal relationship with each participant in the seminar. His role is in this context the most comprehensive and also the most significant, whereas familiarity among participants is of much less importance.

For this reason, the instructor begins by introducing himself; this personal presentation should contain everything of a material, technical and personal nature which is of interest to his listeners in the context of the topic under consideration.

At the same time, in his personal presentation he provides participants in the seminar with an example of how they can subsequently introduce themselves.

### **1.2.2 Personal presentation by participants**

In order to assist participants in the seminar to overcome from the very outset as many as possible of the difficulties mentioned, they will be given a guideline and a reference point in the form of a questionnaire, which they can use to introduce themselves to the group, without having to depend on the example given by the instructor.

On the basis of this "opening" introduction, the group is already able to gain an idea of special or particular problems of the individual with respect to a common goal to be achieved.

### **1.2.3 Objectives**

#### *OBJECTIVES OF THE SEMINAR*

One prime objective will be to unite different personal experience, knowledge and skills to form a useful basis on which each participant can build. This basis is formed by a solid fundamental knowledge of how to use the same concepts and a clear understanding of what they mean; it is further formed by the ability to assess how far facts are complete, to convert these into planning factors, and to adapt them to real circumstances.

To put it in a nutshell, all efforts come together in the ability of each individual to plan the allocation of rooms and timetables at a training centre independently. The entire seminar is a team exercise, and will no doubt produce the best success if each participant contributes his/her experience and also cooperates to the best of his/her ability.

### **1.3 Model Example**

#### *MODEL EXAMPLE*

A new area of specialization is to be established at a training centre.

No rooms are available for this new subject; they must be created from scratch.

The duration of training is three years, with 40 hours per week over 40 weeks in the year. The ratio between theory and practice is to be 30:70.

The applications-oriented scientific sector is to contain the following subjects: technical mathematics, materials technology, work study and technical drawing.

The general education sector is to be individually organized.

Training is classified into the three sections: Basic Stage, Advanced Technical Stage 1, and Advanced Technical Stage II.

The intention is to accept a group of 30 trainees every year.

#### *INDIVIDUAL WORK BY SEMINAR PARTICIPANTS*

Task:

- a) What, in your opinion, would a complete schedule of classes look like for the new area of specialization?
- b) What is the resulting number of rooms required?

## 1.4 Training Systems in Vocational Education

### *SYSTEMS OF VOCATIONAL EDUCATION*

In the first instance, the term "training system" within the entire system of vocational education subsumes all those organized measures taken by the agencies responsible to improve vocational education. The system may have developed naturally over a long period of time by incorporating all the experience gained, or a well-proven system may have been adopted and modified to conform to local conditions. The latter case is true for all countries with young, developing industries, and it is almost self-explanatory that the German system can successfully compete with other systems available, even if or precisely when a preceding colonial phase has already stamped its mark on the country. Experience has shown that difficulties arise with regard to: integration into a country's system of general education; the grading of leaving certificates; and entitlement to continuing education. No other system in the world is as practically oriented as that prevailing in Germany, where even higher certificates – up as far as academic degrees – build on practical know-how.

The measures and goals governing a system of vocational education can be defined quite clearly.

#### Measures:

- Ordering of courses of vocational training with legal backing;
- Training of instructors;
- Research into vocational education, model experiments and training resources in vocational education;
- Organization and financing of vocational education.

These measures, even though the emphasis may perhaps be different in each case, have the following

#### Goals:

- Improvement of the quality of training;
- Improvement of educational involvement;
- Cooperation between the places of learning;
- Safeguarding of the supply of training places;
- Creation of educational opportunities for intellectually and materially disadvantaged persons;
- Participation and co-determination for all those involved in vocational education.

All basic considerations of the training system in the Federal Republic of Germany are stipulated in the Vocational Training Act. In accordance with the structure of society, and in particular with reference to the dual system generally practised, the Handicrafts Regulations Act supplements this Vocational Training Act and defines its provisions in more detail.

In the wording of the Act, vocational education comprises the following branches:

- Initial training;
- Further training;
- Retraining.

There are courses of vocational education in the following combinations or at the following institutions:

1. Firms and vocational schools – the so-called "dual" system;
2. Specialized vocational schools;
3. Vocational extension schools, higher technical schools, technical grammar schools;
4. Technical colleges.

A distinction is made in initial training between:

- Courses of education leading to occupational qualifications;
- Courses of education enabling students to follow a particular occupation;

- Courses of education resulting in a double profile (exclusive to technical colleges).

The whole of vocational training in the Federal Republic of Germany lies in the joint responsibility of government and industry.

In the above context, merely the two basic systems of vocational training have been compared. No mention has been made of mixed forms or of special facilities.

#### 1.4.1 Dual system

##### *DUAL SYSTEM*

The so-called "dual system" is the most important component of courses of education leading to qualifications in a chosen occupation, and at the same time forms the central point of all initial vocational training. Training is conducted on the basis of a training contract concluded under civil law in government-recognized trainee occupations and training premises.

It is divided into a practical component in a firm authorized to provide training under the guidance of an instructor, and a theoretical component which is provided by the vocational school, either on one day's full schooling per week or in exceptional cases in a form of block teaching. Besides providing theoretical occupational knowledge, the vocational schools also have the task of deepening and perfecting the students' general education with special relevance to training in their chosen occupation or occupational activity, and of supplementing practical training in so-called "practical technical instruction".

The dual system of initial training can be implemented wherever a sufficiently large number of industrial and craft establishments can be involved in training.

In principle, this system of training has predominated in the Federal Republic of Germany ever since vocational training was first introduced.

Firms and schools share the task of providing trainees with the knowledge and abilities necessary to gain an occupational qualification. It is logical that the vocational schools should lay more emphasis on imparting know-how and theoretical, factual knowledge, and that the firms should concentrate more on abilities and skills.

Of course, the considerable advantages exhibited by this system of training are also accompanied by certain disadvantages.

Nevertheless, the advantages are seen to predominate, for otherwise this system would not be so extensively applied.

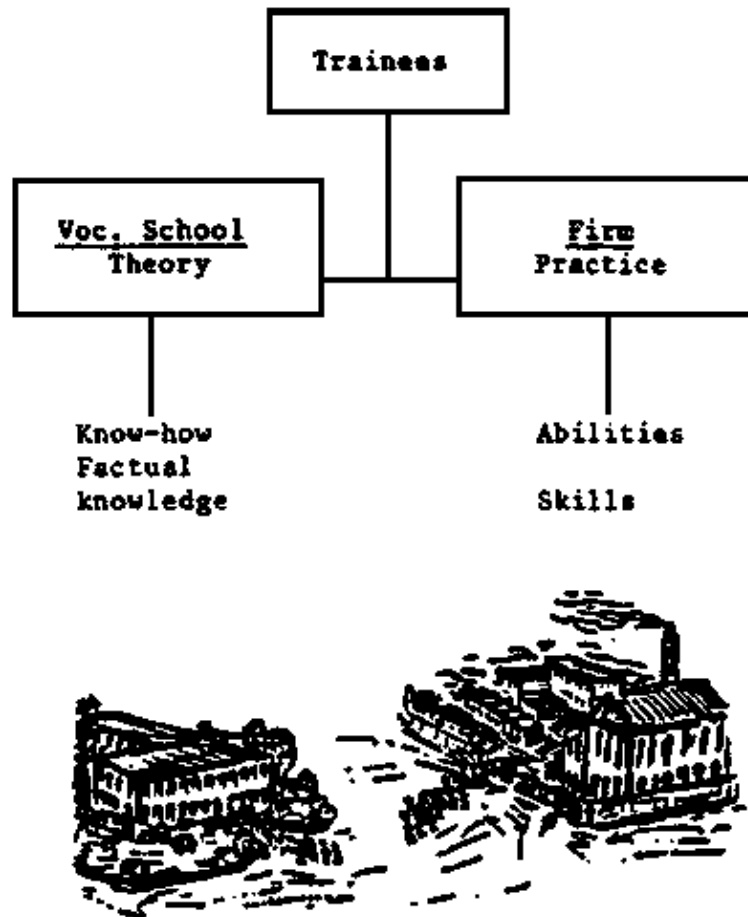
In the interests of completeness, the advantages and disadvantages of the dual system of training will be contrasted below.

##### Advantages:

- Close association with practical activity in the firm;
- Constant adaptation of training to technical and in-plant developments;
- Necessity of constant coordination under joint responsibility;
- Favourable sharing of training costs.

##### Disadvantages:

- Difficulties in the concentration of training (parallelism of training contents);
- Possible conflict of interests.



#### 1.4.2 System of specialized technical schools

##### *SYSTEM OF SPECIALIZED SCHOOLS*

"Double-profile courses of education" is the designation given to courses providing access both to courses of higher education in the tertiary sector and to occupational qualifications or specialization. This form of training takes place largely in schools of a full-time nature, but also to a lesser extent in in-firm or inter-firm training workshops.

Training lasts generally for two to three years; the most important types of school in the Federal Republic of Germany are higher technical schools, specialized or technical grammar schools, specialized technical schools or technical colleges and advanced technical schools. The term "specialized technical school" may, however, also be encountered in the sector of initial training as a "one-year specialized vocational school" in the form of preparation for an occupation with training continuing in the dual system. It is here thus merely one section of training. In agreement with the firms providing training, the school here gives a solid, uniform grounding in theory and practice during the first year of training. This grounding ensures that transition to the advanced technical stage ensues without difficulty and at the same time compensates for any marked differences in in-plant training.

In contrast to the dual system, all training conducted in full-time teaching takes place at a school establishment. This means that both theoretical knowledge and practical abilities and skills are imparted by the training establishment.

The main forms of specialized technical school in the Federal Republic of Germany are those specialized vocational schools attached to part-time vocational schools; these specialized vocational schools provide for advanced education qualifications within the framework of training skilled workers or craftsmen. They include above all master craftsmen's colleges and technical colleges. There are also specialized technical schools and colleges for certain specific skilled occupations.

Here too, the advantages and disadvantages of the two types should be contrasted:

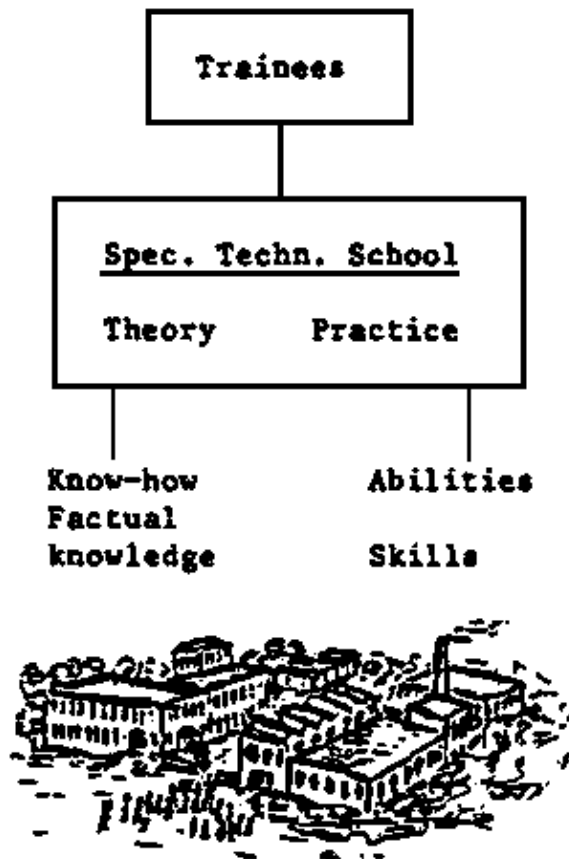
### Advantages:

- Homogeneity of training;
- No interruptions in the timetable by alternation of places of learning.

### Disadvantages:

- Danger of losing relationship with practice;
- Lack of contact with technical and in-plant development;
- Heavy financial burden on body providing for schools;
- Low level of training capacity.

In large areas of the world, it is only possible for initial vocational training to be given at specialized technical schools. Nevertheless, efforts are being made everywhere to involve existing industries and firms in training, and to come closer to the dual system.



## **2. What target data are needed in order to plan the allocation of rooms and timetables?**

### *PRECONDITIONS FOR PLANNING THE ALLOCATION OF ROOMS AND TIMETABLES*

#### **2.1 Target Data for Planning Rooms and Lessons**

The smooth running of vocational training is generally dependent on four basic factors:

- Buildings and facilities;
- Areas of specialization and training objectives;
- Teaching staff and personnel;
- Trainees.



### 2.1.1 Buildings and facilities

#### *BUILDINGS AND FACILITIES*

In planning the architecture of the training establishment, the Federal Republic of Germany has a whole series of legally established standards with respect to the various details of the construction, e.g. room sizes, room proportions, space required, and many more... These are laid down in the "School-Building Directives of the Federal States".

A number of important pedagogical/organizational premises for planning are an essential guide to all those involved in planning: to the body responsible for schools as the funding agency; to the architect for the structural design of the building; and to directors and teaching staff of training establishments as technical advisors providing bodies and architects.

Ideally, of course, the basic curricular goals and contents, and considerations as to their optimum implementation, serve as a basis for overall planning. This presupposes that such concrete ideas on the realization of training courses are already in existence. This applies both to contents which can be assigned to theoretical teaching, just as much as to workshops and laboratories, i.e. to all technical classrooms.

For the teaching of skills, such rooms are referred to as workshops; for teaching orientated towards experience and application, these rooms are referred to as laboratories or labs for short. It will also not be possible to avoid overlaps in individual cases.

Labs and their facilities and equipment must in particular be designed to allow such forms of teaching as student experiments and demonstrations by the teacher/instructor. A further fundamental consideration is the determination of numbers of places in such rooms resulting from long experience. It is advisable to divide student numbers up into whole groups of 24 participants for theoretical instruction, and half-groups of twelve participants for practically oriented subject matter. Designing facilities for individual, partner or team work allows an extremely high level of independence to be achieved among those taking part in training, which is wholly desirable.

Moreover, it has also proved possible to adapt to different class frequencies with ease, provided these basic principles are observed in planning.

When reference is made to overall training plans as a basis for planning, every expert will realize that they are of little direct relevance for designing rooms and establishing equipment requirements because they merely contain study areas and educational objectives as a basis for drafting detailed curricula or methods. As a result of the structure of such overall training plans, it is understandable that the detailed planning of curricula produces educational goals and forms of teaching which will above all leave it unclear what furnishings and equipment are directly required. These must first be deduced. In so doing, a distinction must be made between educational objectives for practical teaching and those for theoretical teaching. Whereas educational objectives for practical work in the subject are generally described as skills, allowing the need for an appropriate object of equipment to be deduced from this with comparative ease, the educational objectives for theoretical teaching in the subject are generally defined as factual knowledge. How this factual knowledge is acquired, whether the teacher imparts know-how to his "students" with "blackboard and chalk", by demonstrating with the aid of teaching aids or by experiments conducted by the students themselves, is in contrast generally left open in the overall training plan.

In order to ensure the close association with pedagogical practice, and to check that the material decisions taken by the agencies in charge are the correct ones, teaching experts from the different sectors must finally be involved.

In addition to the architect's observing the appropriate guidelines, special importance is also to be attached to observing the functional relationship between various building units. This applies in particular to the location of individual rooms or departments with respect to each other.

Each building complex consists largely of the same sub-areas:

- Principal's offices and administration;
- Training area;
- Utility facilities for power and water;
- Recreation and sanitary area;
- Outdoor facilities.

### **2.1.2 Areas of specialization and training objectives**

#### *AREAS OF SPECIALIZATION AND TRAINING OBJECTIVES*

The German word for "subject" can also signify a subdivision in a space or on a surface (shelf, linen compartment, pigeon-hole, ice compartment, luggage locker, etc.); accordingly, it can also refer to a subdivision in a field of knowledge or work (subject area). In the sector of vocational training, the expression "branch of occupations" is used.

Vocational training is generally divided into four branches:

- Technical occupations in industry and crafts;
- Commercial occupations, mainly in industry and service firms;
- Domestic science occupations for homes, institutions, the catering trade and private households;
- Agricultural occupations in the farming sector.

In addition, occupations in the social care and health sector have a certain special status as a branch of occupations.

In each of these occupational sectors, there are in turn at times considerable number of areas of specialization as a further form of classification. Each area of specialization or avenue of employment can be further broken down into individual occupations.

Thus, the German system of initial vocational training is currently broken down on the basis of legislation (Federal Education Act) and ordinances into 14 areas of specialization with over 300 individual occupations in the sector of industrial occupations, and into eight areas of specialization in the commercial sector (including occupations in the services sector). Domestic science and agriculture have similar subdivisions.

The chambers have defined an occupational description for each trainee occupation. These occupational descriptions are a fundamental starting point for every training plan.

A teaching plan is first produced on the basis of the occupational description. "Teaching plan" is the designation – today generally replaced by "curriculum" – for the compilation of objectives and the sequence of contents in individual subjects at a training establishment.

The teaching plan in its turn forms the basis for the overall teaching plan (outline curriculum). Overall teaching plans, also referred to as overall syllabuses, now govern what is to be taught in the form of rough guidelines. They thus consist of a broadly based teaching plan in which the educational objectives are binding but allow the instructor considerable freedom in selecting individual topics.

The overall syllabus is converted into a schedule of subject matter according to timetable and contents. This ultimately indicates the distribution of exactly defined teaching matter in any subject over the months and weeks of a section of training.

It is the instructor's task to plan and prepare every single teaching unit on the basis of this subject matter schedule.

Planning a teaching unit includes the following: selecting teaching and study materials, use of audiovisual aids and technical literature.

The main resources of school principals to organize the sequence of training is the organizational wall chart displaying deployment of teachers, allocation of rooms and the timetable.

#### *CONSOLIDATION OF OCCUPATIONS*

At this stage, reference must be made to the reorganization of metalworking and electrical trades and occupations introduced by the German Industrial and Trade Association in the Federal Republic of Germany. It is hoped that this consolidation will have converted fully into practice by the end of the century.

One not insignificant element in this reorganization is the concept of "qualification" instead of the expressions "knowledge" and "skills" used until now. These terms will disappear from official usage, now that the agencies responsible are in agreement that knowledge and skills are concepts which frequently overlap. In addition to the skills which until now have constituted the objective of training and to a shift in the emphasis they receive, the intention is to promote abilities which are absolutely essential when working within flexible systems of production and assembly, such as the ability to:

- grasp and process something intellectually;
- plan, schedule and design programmes;
- think in abstract terms;
- work in a team (social competence);
- transfer information.

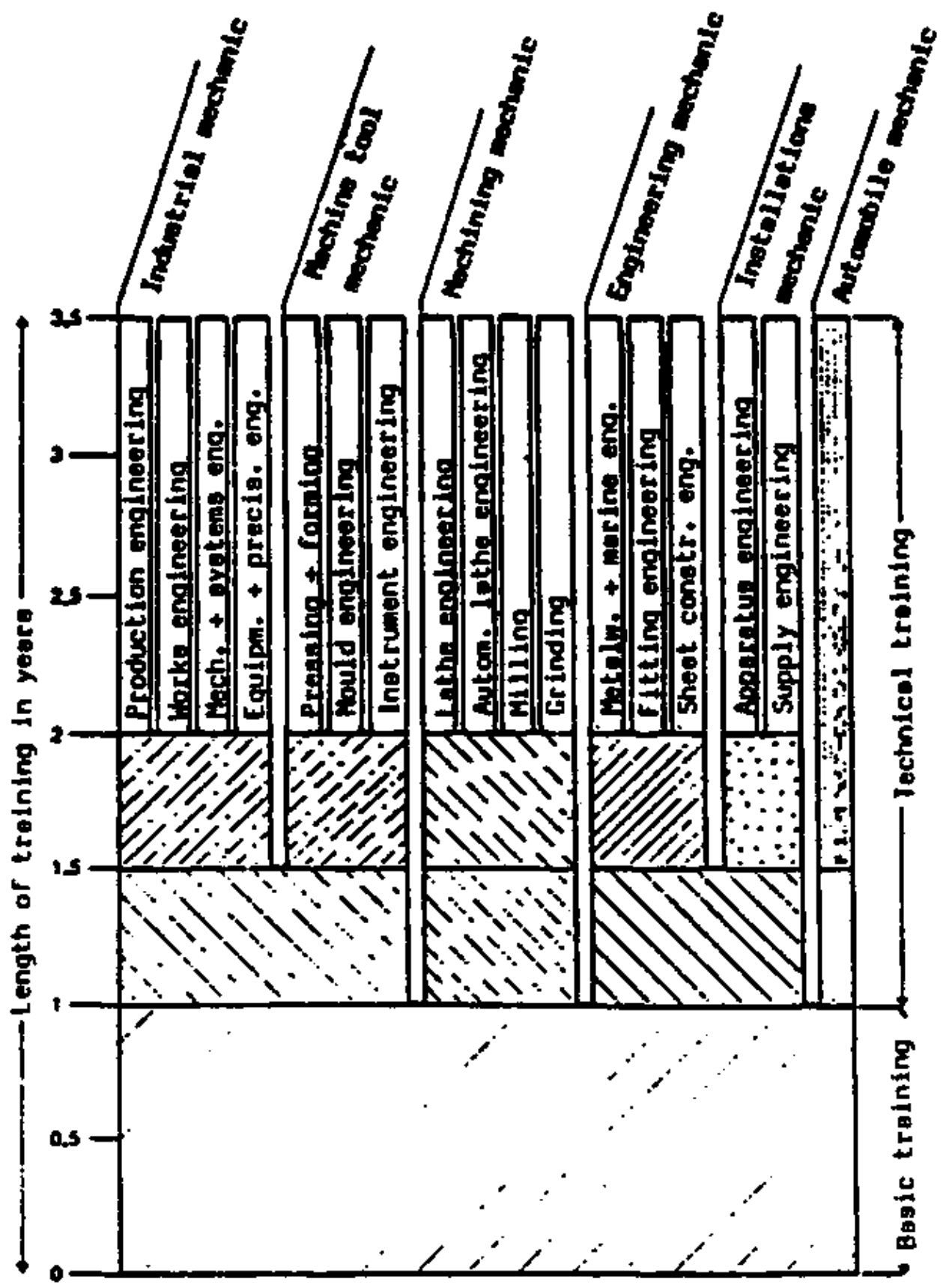
"Qualifications" are understood as the individual capacity to undertake activities presupposing independent planning, implementation and control. Agreement has also been reached that these qualifications are to describe the goals of training in planning regulations, and not the routes leading to such goals.

On principle, the length of training in all industrial occupations is to be three and a half years. The principle of training by stages is to be more precisely defined; a basic stage to be completed by all is to be followed by specialization in the advanced technical stages. Trainee occupations are to be redesigned completely, and brought more into line with the very broad requirements of firms.

The following outline is intended to illustrate this reorganization, taking industrial metalworking occupations as an example.

The occupational field of metalworking is now divided up into only six major occupations, in which a total of 16 specialized training areas are possible.

# Metalworking Occupations in Industry



### 2.1.3 Teaching staff and personnel

The group of persons employed at a training establishment can be distinguished as follows:

- Principal and administration;
- Teaching and training staff;
- Auxiliary staff.

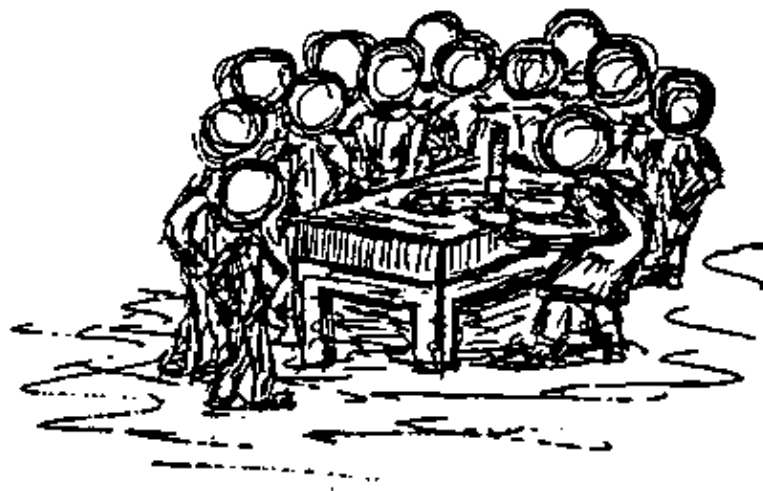
There is absolutely no doubt that the success of a course of training is primarily dependent on the qualification and use of the instructors available. Highly qualified instructors and teachers are more likely to be found in vocational education where special educational establishments are available for them. Teacher training as a measure of central importance must therefore be given particular consideration wherever the system of vocational education is still in the process of being established and developed. Apart from technical know-how and ability, a teacher must also have pedagogical skills. These can be bestowed upon him from birth, but even then he will generally have to attend a course of studies to learn psychological, methodological and didactic subjects in order to be able to satisfy the demands of training.

It has been proved that the best expert in any field cannot be a successful teacher if he has not mastered the technique of teaching. This realization has led to great efforts being made throughout the world to instigate and accelerate the education of vocational training instructors. One familiar difficulty common to all countries lies in the fact that an equivalent place must be found within the hierarchy of posts for people having completed such studies, which means in turn that the legal foundations first have to be created before teacher training can receive its necessary recognition.

The employment of experts from industry or the system of general education is no doubt an unavoidable stop-gap solution, and certainly the best form of optimizing initial vocational training for the moment. In the long run, however, selective "training of instructors" is the only means of achieving the required results in vocational education.

Apart from this, situations will of course repeatedly arise in a training establishment in which specialists from industry will need to be employed to impart quite specific technical contents, wherever a corresponding specialization among full-time instructors can for understandable reasons not yet be assumed.

The choice of all other personnel employed at a training establishment, apart from those engaged in teaching, should not neglect pedagogical/human aspects or special technical qualifications, above all when, for example, a janitor at a training complex will have frequent, often close contacts with those engaged in training.



### 2.1.4 Trainees and apprentices

#### *TRAINEES*

For each course of training, the entrance requirements and the educational goal govern the type of trainee.

Irrespective of the goal of training, a distinction is generally made between courses of training in which trainees pursue their studies exclusively, and such courses in which they are given instruction at a training

centre while being gainfully employed.

There is a clear difference in this context between the training of young people and adult education. There is admittedly no difference in terms of training methods, but the social relationships are characterized by different principles in each case.

The training system, social structures and labour market govern the entrance criteria applied by those responsible in each individual case.

## **2.2 Target Training Data**

### *SECTOR OF TRAINING AND OCCUPATIONAL FIELD*

As has already been indicated in the section entitled "Areas of Specialization", vocational education in the Federal Republic of Germany is classified into four main sectors:

- industrial/technical;
- commercial;
- agricultural;
- domestic science.

Each sector is further subdivided into a series of occupational fields.

### *OCCUPATIONAL IMAGE*

The occupational description clearly defines the overall duration of the course of training, and prescribes obligatory and desirable training contents.

The further time framework is determined by the number of weeks per year and number of hours per week in which training can take place.

The sequence of training is planned to fit into this exact time framework.

### *MAIN TRAINING SYSTEMS*

The usual procedure allows three ways to achieve the prescribed periods of training; the choice will depend on circumstances:

- In simple terms, theoretical training within the dual system is performed at school and practical training in the firm,
  - depending on weighting, alternation between the school and the firm either takes place in a weekly rhythm, or
  - the school portion is conducted in blocks as full-time teaching.
- In the system of specialized technical schools, the entire training takes place at the training establishment.

There are also regional variations of this procedure, but no reference will be made to them here.

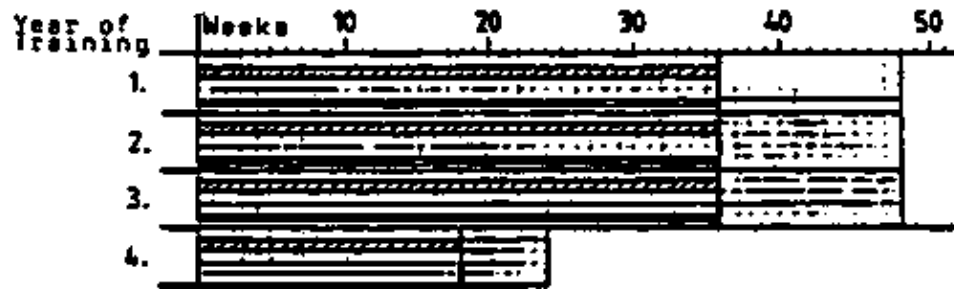
Students are always admitted at the beginning of a school year.

## **2.3 Producing an Overall Training Diagram**

### *MODEL EXAMPLE*

### 2.3.1 Allocation of time during a training course

#### PERIODS OF TRAINING

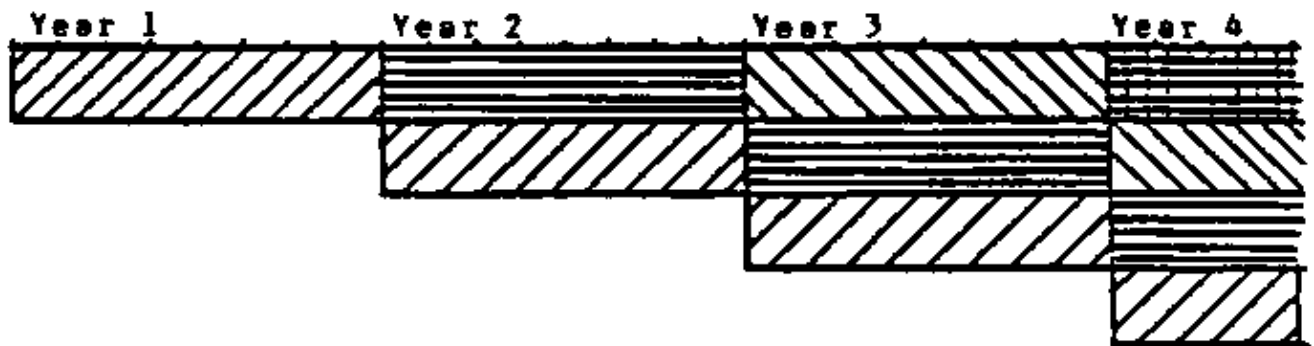




Tues = 9 teaching hours  
 Fri = 4 teaching hours, fortnightly

### 2.3.2 Training cycles

#### TRAINING CYCLE

### TRAINING CYCLE



Theory   
 School  
 Techn. Pr   
 Firm

### 2.4 Model Example

#### MODEL EXAMPLE

Our model example will take the occupational description of a toolmaker as its starting point.

Duration of training is three and a half years; training is conducted over 48 weeks per year, with 40 training hours per week. Theoretical instruction and practical training are to be approximately in the ratio of 30: 70.

This results in a total number of training hours of  $3.5 \times 48 \times 40 = 6,720$  hours.

In our model example, this results in:

4,704 hours for practice;  
 2,016 hours for theory.

Dividing up these hours between individual years of training gives the following distribution:

### Theoretical teaching:

1st year of training	14 weeks = 560 hours
2nd year of training	14 weeks = 560 hours
3rd year of training	14 weeks = 560 hours
4th year of training	8 weeks = 320 hours

### Practice:

1st year of training	34 weeks = 1,360 hours
2nd year of training	34 weeks = 1,360 hours
3rd year of training	34 weeks = 1,360 hours
4th year of training	16 weeks = 640 hours

### *EXERCISE PHASE*

### Task:

What do you think the timetable and training cycle would look like:

- a) in dual training in a six-week block?
- b) in the specialized technical school system?

## **3. What do curricula contain, and how are these contents converted into a schedule of classes?**

### **3.1. Curriculum and sectors of training**

#### **3.1.1 Curriculum**

#### *CURRICULUM AND SECTORS OF TRAINING*

The curriculum applies to a complete course of initial training in one of the trainee occupations, but also to further and continuing education. The objectives and contents correspond to the targets in terms of the contents and duration of training stipulated in the occupational description. Accordingly, the objectives and contents in the curriculum are also binding for carrying out training, although a certain flexibility remains.

The timetabling of teaching material and training contents is defined solely by so-called approximate time indicators. The exact distribution with respect to the timetable is to be found in the schedule of subject matter compiled on the basis of the schedule of classes.

The overall training contents are allocated to certain different sectors in a curriculum, although further subdivision of these sectors into individual subjects is also possible.

#### *SECTORS, INDIVIDUAL SUBJECTS*

The following subdivision has proved successful in industrial/technical training when splitting contents into sectors and individual subjects:

- Sector of general education:

- Mother language
- Foreign language
- Economics
- History/Law

Religious/Ethical instruction  
Sport

– Applications-oriented, scientific sector:

Technical mathematics  
Technical drawing  
Work studies  
Materials technology

– Technological sector:

Workshop training  
Practical instruction

### LOCAL VARIATIONS

Local deviations from this subject breakdown are common, particularly in the sector of general education.

### 3.1.2 Educational objectives

#### EDUCATIONAL OBJECTIVES

Many curricula are preceded by a matrix of descriptions of educational objectives presenting pedagogical/didactic goals and the corresponding different levels of requirements during training.

Classification of goals	KNOW-NEW Information	ABILITY Operations	RECOGNITION Problems	EVALUATION Attitudes	
	<b>Insight<sup>1)</sup></b> into contents of a field of knowledge	<b>Capability<sup>2)</sup></b> defines type of ability required to complete operations	<b>Awareness</b> Problem is grasped in all its important aspects	<b>Openness</b> Interest .....	<b>Inclination</b> .....
	<b>Overview<sup>1)</sup></b> of relationship between important parts of a field of knowledge				
	<b>Knowledge</b> requires clearer differentiation of contents and emphasis on relationships	<b>Skill</b> requires practical, almost effortless ability	<b>Appreciation</b> Solution to problem is comprehended and worked out	<b>Respect</b> Joy	<b>Readiness</b>
	<b>Familiarity</b> gains full command of as many contents and relationships as possible	<b>Mastery</b> means full command of practical behavioural patterns	<b>Understanding</b> Relation(s) to problem is (are) checked and accepted where appropriate (iterative)	.....	<b>Socialness</b> .....

The educational objectives have been explained in more detail in the Section entitled "Meaning of basic terminology".

### 3.2 Organizing Training on the Basis of the Curriculum

#### ORGANIZATION OF TRAINING

A basic training plan defines contents according to syllabus and timetable. Following this, the schedule of subject matter needs to be prepared with particular care. This prescribes the time sequence of subject matter.

It provides the possibility to organize contents logically according to methodological/ didactic criteria, both within one subject and in cross-links between this subject and others. Coordination between individual subjects and sectors is referred to as "the concentration of teaching".

The schedule of subject matter provides the instructor with his topics for training units. He is bound by this schedule in the sequence in which he deals with subject matter. His task is to work out the plan of subject matter.

The latter contains the collection of material organized methodologically/didactically as a plan of teaching for each individual training unit, or in certain cases also for a training module. A training module is understood as the combination of two or more teaching units which are closely related in terms of subject matter.

#### *TEACHING MATERIALS, STUDY MATERIALS, TEACHING AIDS*

In the same way, the instructor supplements his preparation of teaching by selecting suitable teaching materials; these include both educational equipment and materials and the provision of audiovisual teaching aids.

### **3.3 Producing a Schedule of Classes**

#### *SCHEDULE OF CLASSES*

Referring back to the model example contained in Section 2.4, the steps taken when producing a schedule of classes will be pursued below.

The concept of training by stages is becoming more and more accepted in vocational training throughout the world. Apart from time stages, this concept mainly also regards stages in the pedagogical/didactic sense. This division into stages has proved particularly successful, because it does considerably more justice to the different levels of ability among trainees than traditional systems.

In addition, training efficiency is considerably improved if a broad foundation is laid in an occupational field at the entrance stage.

The division into stages has long been a matter of course: at General Basic Level, Advanced Level I and Advanced Level II the emphasis is now moving more and more clearly towards specific individual occupations.

#### *RELATIONSHIP BETWEEN THEORY AND PRACTICE*

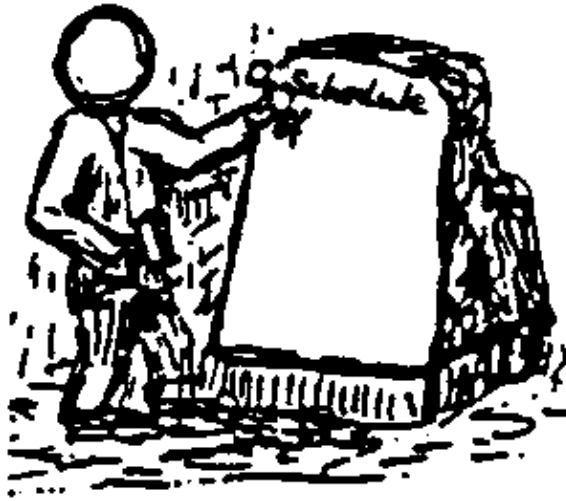
To meet the demands of industry means aiming at achieving a logical relationship between theoretical instruction and practical exercises. Logically there are frequently considerable differences in this respect from one occupational field to another.

A ratio of approximately 3:7 between theory and practice has gradually come to be accepted for industrial/technical training.

This means that the following criteria have been established:

- The time factors of training;
- Training sectors and teaching subjects;
- Division of time between theory and practice.

The schedule of classes can be drawn up on the basis of this information.



### **3.4 Model Example**

#### *PRODUCING A SCHEDULE OF CLASSES*

A schedule of classes can now be developed in group work with participants in the seminar, using the information and target data for the model example quoted under 2.4, and utilizing the training cycles defined. For this task, participants are provided with a worksheet containing the correct solution to the task set under 2.4. This has the purpose of both checking and when necessary correcting the work performed by participants in 2.4.

## **4. What types of room facilities and usable floor space are required in a training centre?**

### **4.1 Determining Types of Room and Floor Space**

#### *PRACTICAL PHASE*

Before dealing with this topic in the seminar, it would appear logical and necessary to activate and collate participants' prior knowledge of this field.

This will no doubt reveal that many of the problems faced, and much of the experience gained, is similar in different countries. The work undertaken in the seminar should then build directly on this foundation.

The first task of participants is therefore:

Draw up a list of rooms or floor space required for the overall running of an industrial/technical training centre.

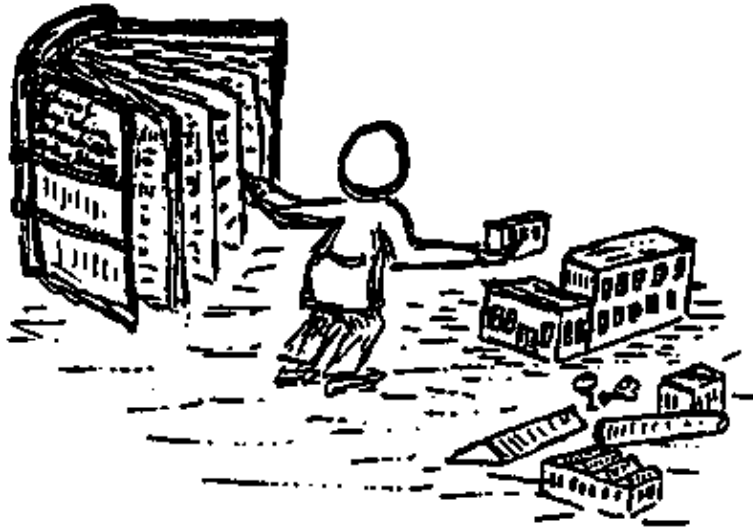
Wherever possible, combine all rooms into groups of rooms having a functional relationship, e.g. "administration", etc.

It will be assumed that the classic division into:

- metalworking,
- motor-vehicle engineering,
- electrical engineering, and
- woodworking

is used in our example.

Please note that your list does not need to provide information about the size of the training establishment; a distinction merely has to be made with respect to the utilization of the different types of room and floor space.



## 4.2 Types of Room Facilities and Floor Space in a Training Centre

### *TYPES OF ROOMS AND FLOOR AREA*

With reference to the comments made above, the following distinction can be made with respect to types of room and floor space:

– Management and administration:

Principal's office  
Vice-Principal's office  
Secretary's office  
Caretaker's office  
Archives  
Copy room  
Conference room  
Storeroom

– Training, theoretical:

Classrooms  
Staffrooms  
Teaching aids  
Physics lecture hall with collection room  
Chemistry lecture hall with collection room  
Language laboratory  
Art room  
Library  
Study room

– Training, practical:

Workshops  
Master instructor's office  
Instruction room  
Laboratories  
Storeroom

– Supply installations:

Electrical power supply  
Water  
Gas

Air-conditioning

– Sanitary facilities:

Washroom  
Changing room  
Toilet  
Health care

– Recreational and cultural facilities:

Assembly hall  
Gymnasium  
Cafeteria  
Hobby room  
Place of worship

– Outdoor facilities:

School playground  
Sports field  
Lawns  
Parking lots  
Fences

In cases in which the school is a boarding school, additional room facilities are required such as: dormitories, recreation rooms, the kitchen sector with dining room, laundry, etc.

### **4.3 Types of Room**

A whole series of further basic considerations are directly connected with the individual use of a type of room:

- Power supply;
- Air-conditioning;
- Use of teaching aids;
- Floor loading;
- Accessibility;
- Height of sun;
- Sequence of organization;
- Supervision;
- Disaster protection;...

### **4.4 Evaluation and Comparison**

The lists of rooms drawn up under Section 4.1 are now compared with the general overview produced together with participants.

## **5. How is the required number of rooms determined and their allocation planned?**

### **5.1 Room Planning on the Basis of Target Training Data**

#### *ROOM PLANNING, FUNDAMENTALS*

The list of types of room and floor space now permits accurate room planning, once the basic data for a training establishment have been established by the agencies in charge on the basis of certain analyses:

#### *AREAS OF SPECIALIZATION*

- The choice of areas of specialization in training results from the economic structure of the region and from the associated requirements for trained personnel.

Naturally, this decision must be based on occupational fields in which the capabilities and knowledge gained in a common Basic Stage offer the possibility to provide training in various individual occupations in subsequent Advanced Technical Stages.

The economic structure of a region has in most cases developed from partly ancient traditions, which frequently still reflect to this day the fundamental need for craft-based services.

In Europe, it is the history of the guilds and corporations, which did not lose their exclusive, determining role until the era of the machine. Many craft occupations have disappeared in the past one and a half centuries. Today, industrial areas of specialization lead the field, also in terms of quality. Certain services can, however, only be rendered in the old form of crafts and trades, and can thus not be replaced by industrial developments.

In other parts of the world, the craftsmen's quarters continue to flourish in the bazaars to this very day, above all in those countries which clearly lag behind in industrialization. Here, a master craftsman passes on his know-how and ability following old tradition to younger persons, generally to his son, and it is virtually impossible to create an organized form of training with generally valid rules and regulations in this context.

It is nevertheless possible to maintain that the worldwide trend is towards a national system of vocational training organized by the agencies responsible for deciding on economic policy. This leads inevitably to international cooperation in the field of vocational training, not least as a result of enormous improvements in means of communication and growing interdependence in the world economy.

#### *GOAL OF TRAINING*

- What the goal of training is to be when planning the training establishment, will depend on local conditions.

This will generally be a form of qualification as a skilled worker.

Nevertheless, other, more advanced training goals are frequently also aspired to and indeed implemented.

In all developing industrial countries, a serious lack of so-called "middle management executives" in firms and companies exerts a brake on more rapid development, and frequently leads to stop-gap solutions which can under no circumstances be permanent. Such temporary solutions advance people to positions for which their qualifications are inadequate for fulfilling the required duties. At the same time, however, the basis is weakened; for, whereas company hierarchies in highly developed countries display a balanced pyramid-like shape with a broad basis of qualified, skilled personnel, a considerably narrower level of middle management and a clear peak dominated by company management, this pyramid is precisely reversed in some cases. In such situations, the labour market usually also has more engineers with a university diploma available than skilled workers.

Traditions, mentality and questions of status in a marked social environment are the most frequent, sometimes apparently almost unsurmountable barriers to a form of industrial development on the European model. However, it will under no circumstances be possible to keep pace with competition around the world by employing semi-skilled workers. A well-trained, qualified skilled worker is the only key. Training of skilled workers should thus take pride of place, for only a good skilled worker can become a good master craftsman.

#### *TOTAL NUMBER OF STUDENTS*

- The total number of students at the training establishment, and their distribution over individual areas of specialization, also results from prior market research.

This aspect also presents similar problems to that of the goal of training. A large backlog of demand frequently makes it necessary for training establishments to be burdened far in excess of their actual capacity. There are clear scientific findings relating to the optimum economic staff-student relationship, i.e. the maximum number of students per class.

Any case of filling such establishments beyond their capacity will mean a deterioration in the results of training, and it must be left to those responsible to decide how far they wish to meet a high demand at the cost of the subsequent skills of trainees. Only one argument can justify such a policy: in the country of the blind, ten one-eyed persons are more valuable than one person with normal vision.

### *TRAINING GROUPS*

- Following these considerations, and in an effort to ensure the success of training, planners should not allow the number of participants in each group to exceed the figure considered to be the absolute maximum according to well-founded general experience.

Groups in theoretical training should not be larger than 30 participants.

The upper limit in practical training should be set at 15 participants.

Naturally, these recommended figures based on experience are also directly dependent on the method of teaching, and in vocational training this is governed by didactic/methodological considerations. The method of pure frontal lecturing, in which the number of listeners is unimportant, is absolutely useless for vocational training.

### *SECTIONS OF TRAINING*

- Reference has already been made to the Basic Stage and to the two Advanced Technical Stages as sections of training. In addition, there is also a division into semesters, a form of division preferred in various countries. Similarly, any form of block teaching must be viewed from the standpoint of training sections.

### *CYCLE*

- The cycle of new entrants to a course of training depends on requirements, and is primarily responsible for determining the sequence of organization and total capacity. It of course also has an effect on the planning of rooms.

## **5.2 Planning the Number of Rooms Required with the Aid of an Example**

### *ROOMS REQUIRED*

#### **5.2.1 Planning data**

Using a practical example, the following fundamental data are to form the basis for planning the number of rooms required:

Area of specialization : mechanical engineer (steel structures) and automobile mechanic

Level of training : training as skilled worker

Duration of training : three years

Number of students : 30 participants per specialization and stage of training

### *INDIVIDUAL WORK BY PARTICIPANTS*

A plan of the number of rooms required at full capacity should now be produced, using these basic facts.

This subject area is to be incorporated as a new department into an existing complex. It is thus not necessary to plan management and administration, the sanitary facilities, the recreational and cultural facilities or outside facilities.

## 5.2.2 Types and sizes of room

### STANDARDS FOR SIZES OF ROOM

The following standard dimensions are stipulated in the "School–Building Directives of the Federal States". They are adapted to climatic conditions in Central Europe, and thus cannot be adopted blindly for other climatic regions. At the same time, they have been determined according to aspects of economy – above all with respect to the financial expenditure made on training establishments –and thus represent so–to–speak an absolute minimum, which should under no circumstances be reduced any further. Hotter climates will automatically require a greater volume of space, particularly as the costs for heating or air–conditioning can frequently be dispensed with.

#### THEORY

##### Training sector, theory

Types of room	Size of room in m <sup>2</sup>
Classroom	75
Staffroom	12.5
Resources room	12.5
Teaching aids room	12.5
Physics lecture hall	100
Collection room	25
Chemistry lecture hall	100
Collection room	25

##### Training sector, theory

Types of room	Size of room in m <sup>2</sup>
Language laboratory	50
Art room	100
Library	50
Study room	50

#### PRACTICE

##### Training sector, practice

##### Metalworking and automobile workshops

Types of room	Size of room in m <sup>2</sup>
Bench workshop	100
Machine workshop	200
Forming workshop	100
Welding workshop	100
Automobile workshop	200
Machine laboratory	150
Assembly laboratory	125

Measurement and testing laboratory	50
Control engineering	50
Materials testing	75
Automobile laboratory	100

Training sector, practice Electrical engineering workshops

Types of room	Size of room in m <sup>2</sup>
Materials processing	100
Electrical wiring	100
Etching, soldering and winding	50
Small machine laboratory	75
Large machine laboratory	75
Power engineering laboratory	75
Communications engineering laboratory	75
High-frequency engineering laboratory	75

Wood workshops

Types of room	Size of room in m <sup>2</sup>
Benchroom	150
Machine room	125
Sharpening room	25
Wood pre-treatment and cutting room	125
Technical laboratory	125
Surface treatment	50
Veneer room	75
Master instructor's office	12.5
Instruction room	25
Storeroom, metal	not specified
automobile	not specified
electrical engineering	not specified
wood	not specified

**5.3 Allocation Schedule (Plan of Distribution)**

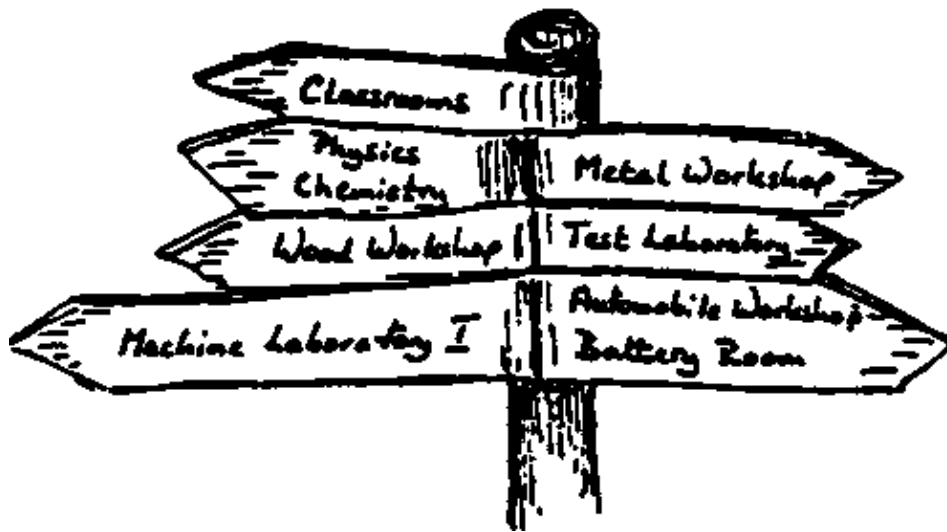
*SELECTION CRITERIA TECHNICAL ROOMS*

The choice of certain room facilities for planning a course of training presupposes a decision in favour of a certain area of specialization, apart from the general basic data determined in preceding sections; this

decision must lead to different combinations, particularly in the workshop sector.

Our example refers to the training of mechanical engineers for steel structures and automobile mechanics (5.2.1).

Production of the plan for the number of rooms required and a room allocation schedule by all participants in this seminar follows the preliminary observations made above.



## 6. How do room allocation schedules and timetables vary for different areas of specialization?

### 6.1 Determining Timetables and the Allocation of Rooms with the Aid of Examples

#### *CONVERSION INTO PRACTICE*

The know-how and experience gained from the material dealt with so far contains and incorporates all the fundamental information necessary to achieve the goal of this seminar, namely to produce room allocation schedules and timetables for vocational training.

The task now is therefore to convert this knowledge into a practical situation like that encountered by participants in their own fields of responsibility in their home countries, using concrete examples.

#### *RECOMMENDATION*

In doing so, restriction to the classic areas of specialization is recommended.

#### *CLASSIC AREAS OF SPECIALIZATION*

The following areas of specialization are considered traditional:

- metalworking;
- automobile engineering;
- electrical engineering;
- woodworking.

Depending on the circle of participants, other areas of specialization can easily be incorporated as required.

#### *WORKING MATERIALS REQUIRED*

The only condition is that the corresponding training curricula from the Chambers of Industry and Commerce or the Chambers of Handicrafts, or documents presented by participants from their own countries, should be available.

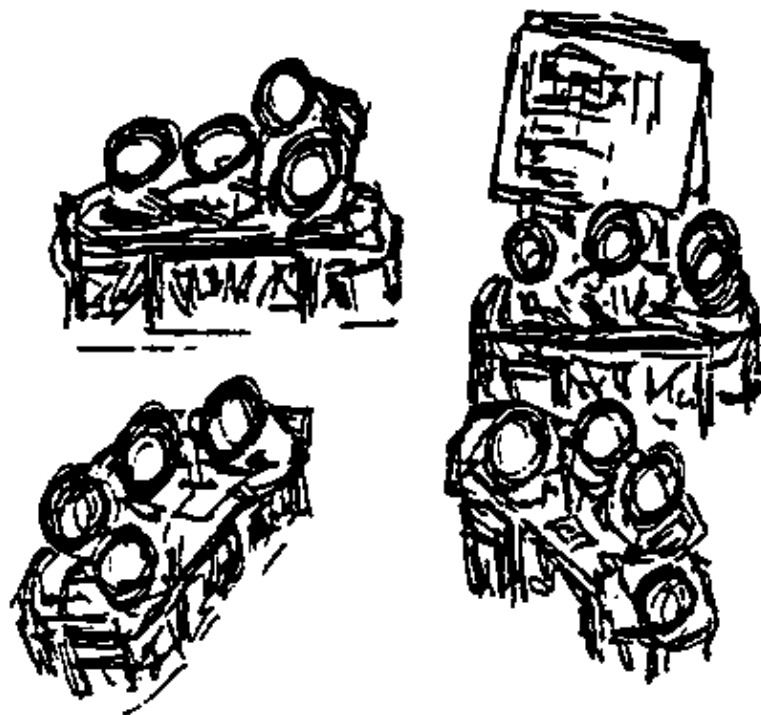
## METHOD

In order to facilitate the task and to meet wherever possible the individual needs of participants, groups will now be formed, each of which will solve the task of producing a plan for the allocation of rooms and a timetable for a certain area of specialization against the background of a complete set of basic data.

## 6.2 Evaluation and Discussion

### EVALUATION AND DISCUSSION

The last two hours of time available will be used to evaluate and discuss jointly the proposals made by the groups.



## 7. How can changes in the training situation be faced from the standpoint of room allocation and the timetable?

### 7.1 Additional Training and Further Training Measures

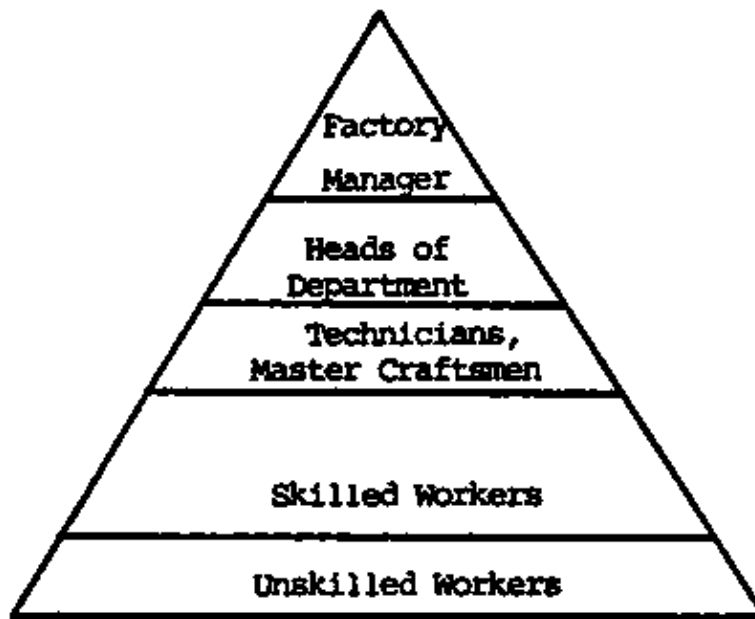
#### SPECIAL TECHNICAL REQUIREMENTS OF THE ECONOMY

The need for qualified personnel in various countries often goes beyond skilled-worker level, either in continuing training on the basis of such a qualification, or because the economy has an urgent need for specially trained manpower.

Reference has already been made to the problem of the supply and demand of qualified manpower, and to the difficulties and anomalies to be found practically everywhere in the structure of firms with respect to the numerical ratio of staff at different levels. It must be emphasized once more that a sound and forward-looking system of planning in the sector of training must take account of the fact that the pyramid first needs to be constructed; for example, it must take into consideration that for one factory manager there must be five heads of department, for one head of department there must be ten technicians or master craftsmen, for one master craftsman there must be 20 skilled workers, and for one skilled worker perhaps three unskilled workers.

#### STRUCTURAL PYRAMID

## Structural pyramid



A building can only be constructed by starting with the foundations. These foundations must be strong and stable if the upper storeys are to be built upon them. This can only be effected on the basis of additional training and further training measures.

### *EXAMPLE*

Thus, for example, in a country in which the most flourishing branch of industry is mining, an electrician, a mining mechanic or automobile mechanic cannot satisfy the demands made by firms without a specialized form of further training.

### *EXPERT REPAIR AND MAINTENANCE PERSONNEL*

A large number of firms of this or a similar nature suffer particularly from a lack of trained and qualified personnel capable, for example, of performing repairs when there is an inadequate supply of spare parts, and able to reduce the need for repairs to equipment and machines by implementing selective, expert maintenance.

Naturally, the primary need in this context is for basic occupations in the field of metalworking, electrical engineering and automobile engineering, but nevertheless an emphasis must be laid on repair and maintenance by concerted training measures.



## 7.2 Duration of Training

### *DURATION OF TRAINING*

The duration of a course of training is governed by many factors, primarily however by training contents and objectives.

The calendar year and seasons can also be decisive factors for determining periods of training, either as a whole or in sections. Thus, for example, the subdivision into semesters or six calendar months is common everywhere today; for shorter sections, the trimester or monthly periods are also known.

There are already generally valid ideas concerning the duration of training for specializing in maintenance and repair work.

A period of training lasting three years will be assumed as the time schedule for training qualified maintenance and repair personnel.

This duration of training guarantees a good foundation of technical know-how and ability, even if some contents may be viewed as the revision of subject matter dealt with in preceding stages of vocational training. Experience has shown, however, that such prior knowledge is not uniform and has gaps, even if great efforts have been taken in a large number of countries to eradicate these serious shortcomings.

### *THEORY / PRACTICE*

For the situation described here, the standard split into theoretical and specialized technical training contents is proposed with equal weighting. Subdivision within the levels of training can commence with an emphasis laid on practical work, and conclude with a corresponding emphasis laid on theoretical instruction.

The following subdivision would be one possibility:

– Ratio of theory to practice:	
Basic Stage	40%: 60%
Advanced Technical Stage I	50%: 50%
Advanced Technical Stage II	60%: 40%

### *BASIS FOR TRAINING*

As a basis for training, a combination must now be found between the technical know-how and ability for a basic occupation and the special requirements demanded by repair and maintenance activity.

The task can be considerably simplified if the vocational schools in a country train machine fitters, electricians, automobile mechanics, etc., and if qualifications such as these can be taken as a basis for further training.

Where this is not the case, the essential conditions required would have to be created as first priority.

## 7.3 Level of Training

### *LEVEL OF TRAINING*

It is assumed that the course of training constitutes a further training measure, i.e. it follows on from basic technical training in the appropriate sector (metalworking, automobile engineering, electrical engineering).

We are thus concerned with a middle level of vocational training, the aim of which should likewise be to achieve a middle position in the firm (comparable to master craftsman or technician).

## 7.4 Producing a Room Allocation Schedule and a Timetable

### *INDIVIDUAL GROUP WORK*

The basis described above is followed by group work consisting of the production of appropriate plans for room allocation and timetables.

## 7.5 Evaluation and Discussion

### *EVALUATION*

On conclusion of the work, the individual findings are evaluated and discussed together.

## 7.6 Producing a Situation Report

### *SITUATION REPORT*

#### Evaluation criteria for including a new course of training in existing training establishments

Suggestions or requests for the implementation of new courses of training come either from industry in a country or from the school sector.

Its implementation is already marked out by the system of training in practice, by the corresponding legal foundations and by all the directives and regulations in force.

The official body responsible, usually a government body, decides on the introduction of new training courses, and generally entrusts an existing institute with their planning and realization.

The rough framework is laid in discussions between the authorities of government and industry, and areas of specialization and levels of training defined. The planning body authorized has the initial task of planning a detailed outline of training (occupational description), which lays down the training objectives for theory and practice.

The curriculum, if it is not prescribed, must then be designed to fit the described occupation.

The scope and contents of training are thus fixed, and plans can now be made for the timetable and allocation of rooms. This can only be completed in direct cooperation with the institute in question.

### *PLANNING STAGES*

Assuming that a seminar participant has been authorized in the situation described above to conduct further planning, he must undertake the following measures:

1. Produce a plan of the number of rooms and hours required for the new course of training with lists of equipment.
2. Make an inventory of existing room facilities and available equipment.
3. Establish the technical qualifications and teaching load of the training staff already employed.
4. Make an exact definition of free capacities with regard to room facilities, equipment and teaching staff.
5. Determine the uncovered demand in all three sectors.
6. Decide on possible expansion, e.g. accommodation and running of the new course of training.

### *ADVICE*

7. The following must always be taken into account in all the measures mentioned above:

- a) Every proposal must be justifiable;
- b) Decisions and findings must be recorded in writing;
- c) Every action must be taken within the scope of valid laws and directives;
- d) All steps taken are to be coordinated with and agreed to by the authorizing body.

## **8. What is the relationship between the experience gained in this seminar and its application in practice?**

### **8.1 Concentrated Summary**

#### *SUMMARY*

On conclusion of the seminar work, a concentrated summary again lists the principles forming the basis for logical procedure when producing room plans, room allocation plans, timetables and class-hour distribution plans.

1. The planning documents must be complete:

a) Exact study of such initial criteria as

- needs of the economy and/or the country;
- decision as to areas of specialized training;
- training capacity and time schedule;
- legal foundations.

b) The contents listed under a) are then followed by

- determining the number of rooms required;
- producing a schedule of classes.

#### *EXAMPLE*

As examples, which are not by any means complete, a number of excerpts from statistical surveys conducted in Baden-Württemberg are included below, which might perhaps act as determining factors in the first planning phase for locations, areas of specialization and size of buildings.

Training establishments already in existence in the administrative structure of the federal state



- Vocational school for industrial occupations
- Vocational school for commercial occupations
- ▲ Vocational school for occupations in domestic science and agriculture

## STATISTICS

### Development of population

Development of population in Baden-Württemberg 1965 – 1990

Total on 1.1.	0–1 yrs.	6–7 yrs.	10–11 yrs.	15–16 yrs.	18–19 yrs.	Total Population
1965	157 669	130 992	115 137	111 976	94 535	8 257 397
1966	155 571	138 714	117 743	113 762	106 578	8 426 202
1967	157 455	143 449	125 719	112 370	113 124	8 534 106
1968	152 272	150 072	129 462	113 928	116 536	8 565 471
1969	145 630	151 797	133 064	114 640	120 117	8 713 893
1970	137 724	157 491	141 375	120 016	120 693	8 909 699
1971	128 327	159 921	145 796	121 481	120 334	8 994 539

1972	128 700	157 000	152 500	128 700	119 100	9 078 100
1973	129 200	158 300	153 900	132 400	122 400	9 160 200
1974	129 700	154 500	159 000	135 700	123 900	9 241 000
1975	130 400	147 500	161 500	143 300	131 100	9 320 600
1976	131 200	139 400	158 500	147 700	134 800	9 399 300
1977	132 400	130 100	159 900	154 500	138 000	9 477 500
1978	133 800	130 500	156 000	155 900	145 700	9 555 300
1979	135 500	130 900	149 000	161 000	150 100	9 633 100
1980	137 400	131 400	141 000	163 400	156 700	9 711 200
1981	139 600	132 100	131 600	160 500	158 100	9 790 000
1982	142 000	133 000	132 100	161 800	163 200	9 869 600
1983	144 700	134 100	132 500	158 000	165 700	9 950 600
1984	147 300	135 500	133 000	151 000	162 700	10 032 900
1985	150 000	137 200	133 700	142 900	164 100	10 116 600
1986	152 600	139 000	134 500	133 600	160 300	10 201 700
1987	154 900	141 300	135 700	134 000	153 300	10 288 100
1988	156 800	143 700	137 100	134 500	145 300	10 375 300
1969	158 200	146 300	138 700	135 000	136 000	10 463 000
1990	159 100	148 900	140 700	135 700	136 400	10 550 800

Source: State Statistical Office

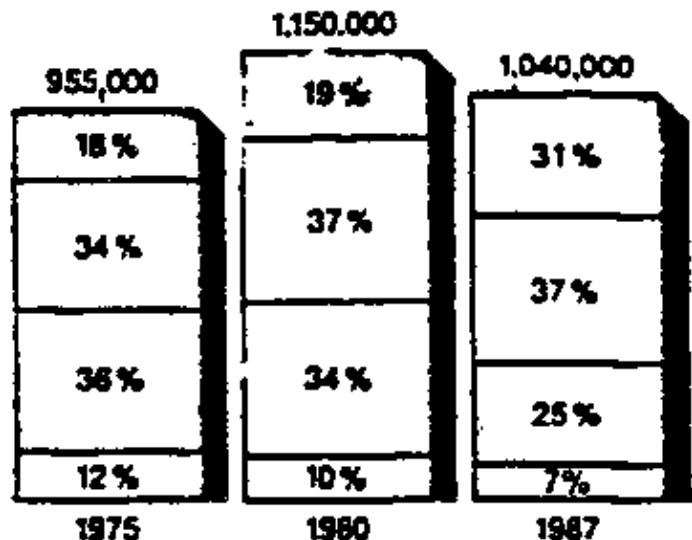
**Number of school-leavers with**

certificate of aptitude for higher education/  
specialized short-course higher education

intermediate leaving certificate

lower secondary leaving certificate

without lower secondary leaving certificate



Number and qualification of school-leavers

Development of student numbers at maintained vocational schools from 1970/71 to 1980/81

School Type	Percent of total	1970/71	1975/76	1979/80	1980/81	Increase 1971-80/81	as % of 1970/71
Vocational Schools	8.1	237260	242000	218000	219000	81700	35
Vocational Schools	8.1	237260	242000	218000	219000	81700	35
GRASS. SCHOOLS	1.1	3241	3600	4800	4500	2200	67
1yr spec. voc. schools leading to	1.1	3241	3600	4800	4500	2200	67
Voc. SCHOOLS, CRTS.	1.7	5094	5200	4700	4000	2000	40
Voc. gram. schools, incl. gen. techs.	1.1	3241	3600	4800	4500	2200	67
SECONDARY SCHOOLS	1.2	3527	3800	3800	3800	2000	57
Planning sector	1.1	3241	3600	4800	4500	2200	67
Other special voc. schools	1.1	3241	3600	4800	4500	2200	67
Spec. techs. schools + techs. colleges	1.1	3241	3600	4800	4500	2200	67
Vocational schools	1.1	3241	3600	4800	4500	2200	67
TOTAL	1.1	3241	3600	4800	4500	2200	67

Development of student/pupil numbers

Departmental demand and total demand of classrooms at maintained vocational schools 1970 - 1980

School type	Existing classrooms in November 1967	NEW CLASSROOMS BUILT		Existing classrooms at end of 1970	Additional classrooms demanded 1970-1980	Existing demand 1970	Total demand of 1970 or 1980
		1968	1970				
Vocational Schools					280	300	580
Vocational Schools					10	20	30
GRASS. SCHOOLS							
1yr spec. voc. schools leading to					90	110	200
Voc. SCHOOLS, CRTS.							
Voc. gram. schools, incl. gen. techs.					60	90	150
SECONDARY SCHOOLS							
Planning sector					600	600	1200
TOTAL					1000	1100	2100
Other special voc. schools					60	90	150
Spec. techs. schools + techs. colleges					30	60	90
TOTAL	171	11	100	281	1000	1100	2100

Needs analysis

Summary of plans submitted for full-time maintained vocational schools in the administrative region of South West Hampshire - by district

District	County	TOTAL no. of schools	1970/71				1971/72				1972/73				1973/74			
			1970/71	1971/72	1972/73	1973/74	1970/71	1971/72	1972/73	1973/74	1970/71	1971/72	1972/73	1973/74	1970/71	1971/72	1972/73	1973/74
1. Basingstoke	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Basingstoke	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3. Eastleigh	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4. Fareham	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5. Havant	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7. Winchester	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17. Southampton	HANTS	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

Model plan

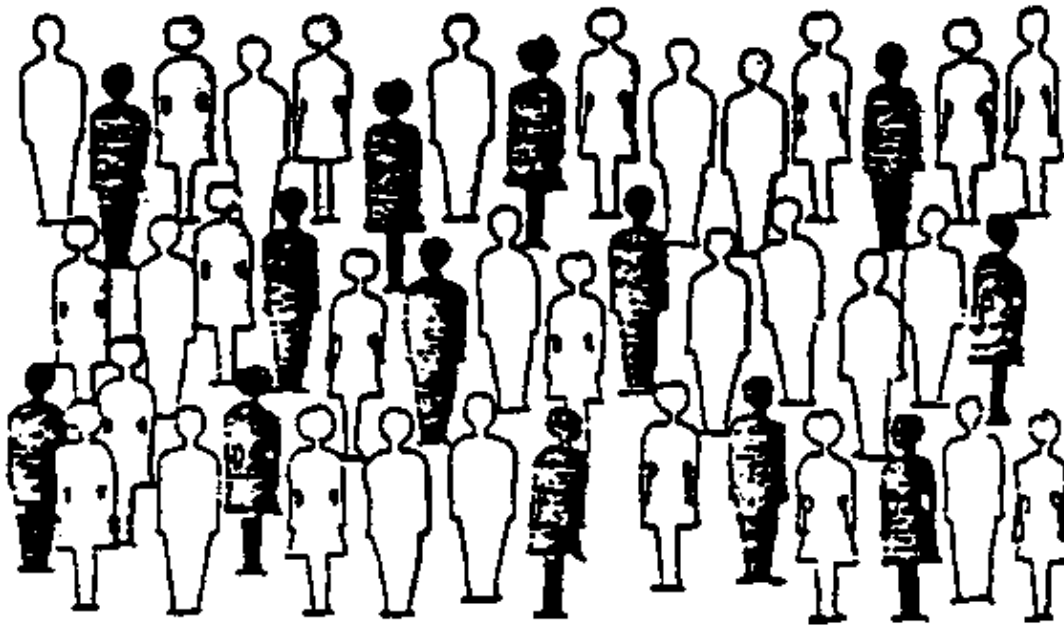
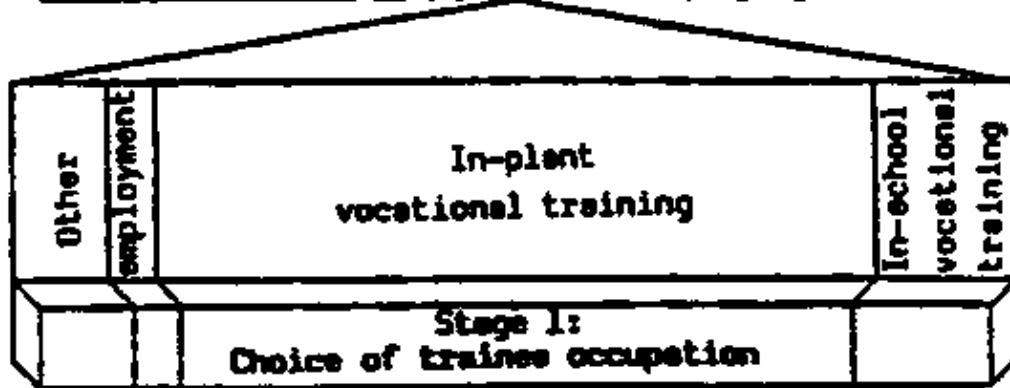
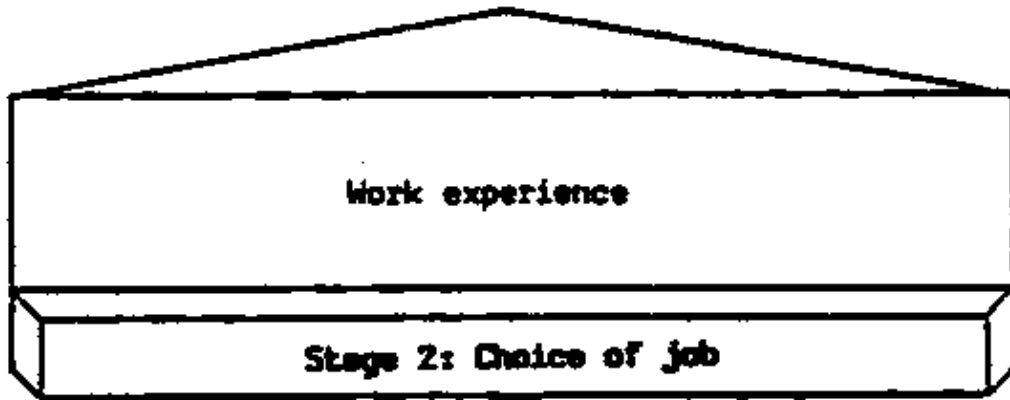
Building costs for school building construction in residential vocational districts in the period between 1970 and 1980 - constant prices -

School type	Total expenditures (Salaries, building & equipment expenditures) of school district, years 1970-1980		Cost index '80		Total building costs 1970-1980 in bill. \$000 - constant prices -		Substantiated building costs 1970-1980 in bill. \$000 - constant prices -	
	Actual I (Special Developm. Plan II)	Actual II (Special Developm. Plan II)	Total Building Costs	Substantiated Building Costs	Actual I (Special Developm. Plan II)	Actual II (Special Developm. Plan II)	Actual I (Special Developm. Plan II)	Actual II (Special Developm. Plan II)
Vocational								
SENIORES	2210	1510	306700	252000	677.8	463.3	565.3	386.3
SENIORES								
SENIOR SENIORS	130	130	306700	252000	39.9	39.9	33.3	33.3
yr spec. voc.								
SENIORES including 80								
SEC. SENIORS. INTL.	1050	750	306700	252000	444.7	238.0	370.9	191.9
SEC. SENIORS. SENIORS.								
SEC. SENIORS. SENIORS.	1350	450	306700	247700	384.7	140.8	279.0	134.0
PLANNING SENIORS	110	110			150.0	871.2	1791.5	742.2
Seni. spec. voc.								
SENIORES	110	210	306700	252000	64.0	64.4	53.7	53.7
Spec. train. seniors								
- SENIORS. SENIORS	180	180	306700	252000	55.2	35.2	46.0	46.0
Total	5430	3330			1676.7	2013.4	1708.2	845.2

Outline of construction costs for financial planning

INFORMATION

Information for applicants for a training place



32 %

Young persons with and without lower secondary leaving certificate

37 %

Young persons with intermediate leaving certificate

31 %

Young persons with certificate of aptitude for higher education/specialized short-course higher education

Diagram of promotion in chosen occupations

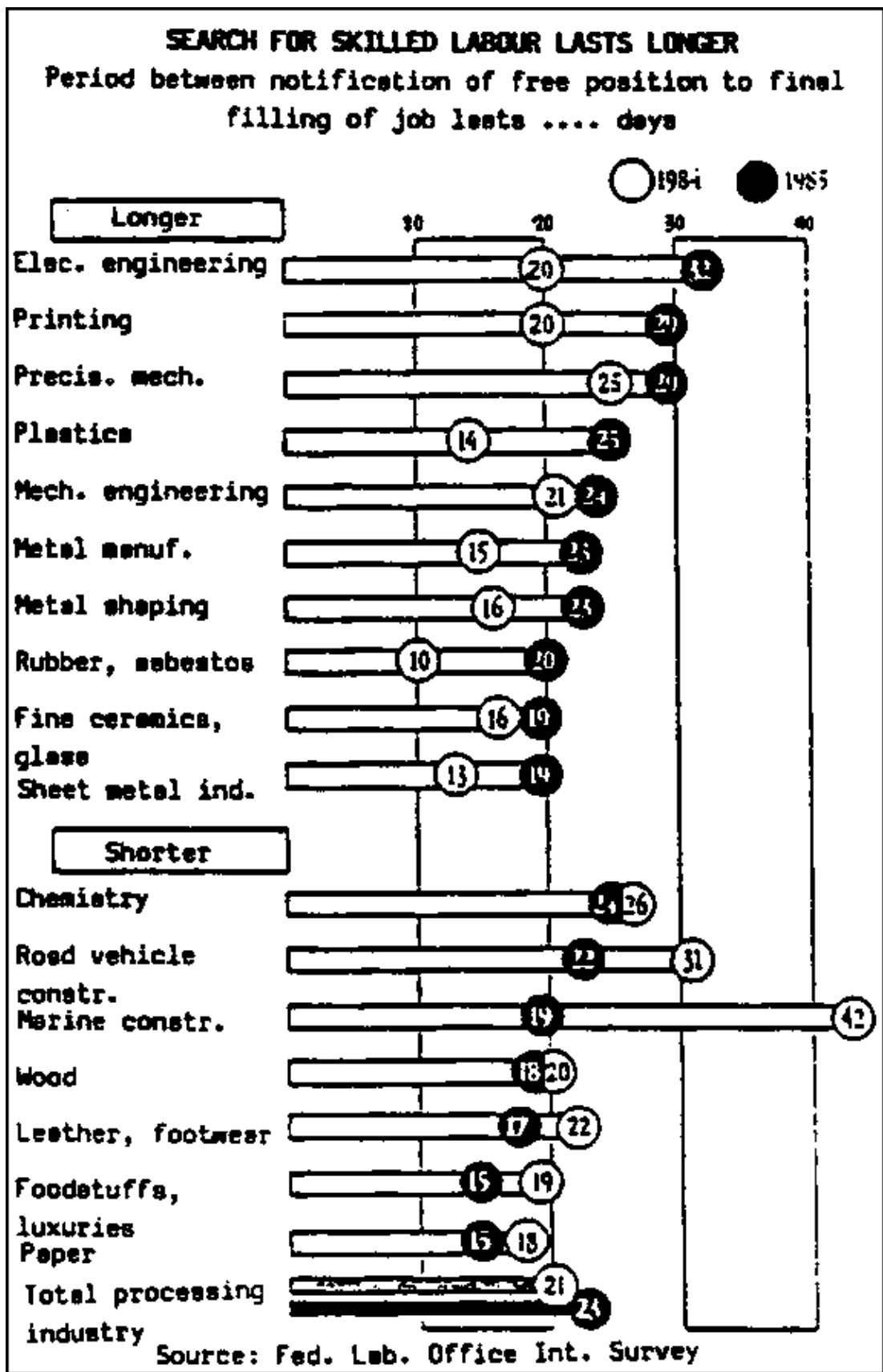


Diagram of occupational opportunities

#### DETAILED PLANNING

2. The detailed planning follows on the basis of the data referred to under 1.

a) This takes account of four basic elements in a training establishment:

- Buildings and equipment;
- Areas of specialization and training objectives;
- Teaching staff and personnel;
- Trainees.

Whereas administrative and financial experts generally define the rough framework with occasional advice on preliminary planning from schools and teachers, from now on it is the experts in training who are primarily involved in the work of planning.

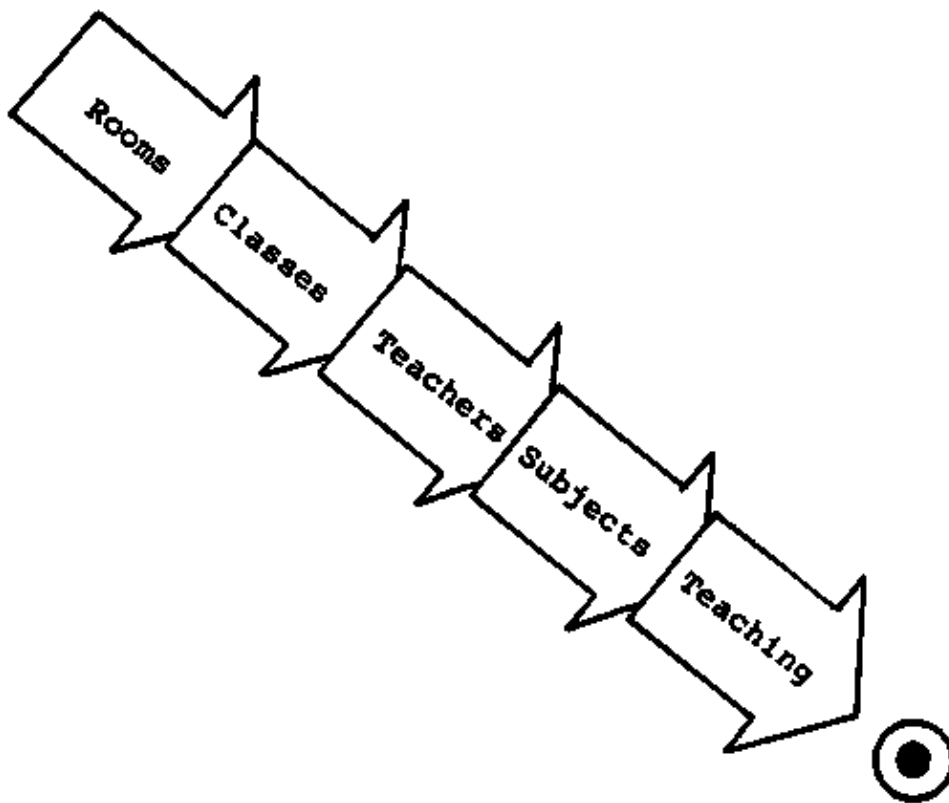
b) The result of detailed planning in the individual sectors is as follows:

- Plan of number of rooms required and room allocation;
- Overall syllabus and schedule of subject matter;
- Quantitative and qualitative needs analysis;
- Training certificate/qualification.

### *ORDER OF SEQUENCE IN PLANNING*

3. It has proved successful in such planning to proceed always in the following order:

- Rooms;
- Classes;
- Teachers;
- Subjects;
- Teaching.



## **8.2 Discussion**

### *DISCUSSION*

The concentrated summary should lead to a discussion, in the course of which seminar participants are to be given the opportunity of voicing any points which are unclear with respect to the subject matter treated.

Further unanswered questions may arise.

If these can be seen as belonging to the overall topic of the seminar, they can be discussed and, where possible, clarified.

Little time will remain for repetition, but it is extremely important to guide the discussion in such a way that it follows the basic pattern outlined by the subject matter of the seminar. This will play a major part in stabilizing participants' confidence in their mastery of this subject matter, something which will no doubt be extremely necessary if only from the point of view of its volume.

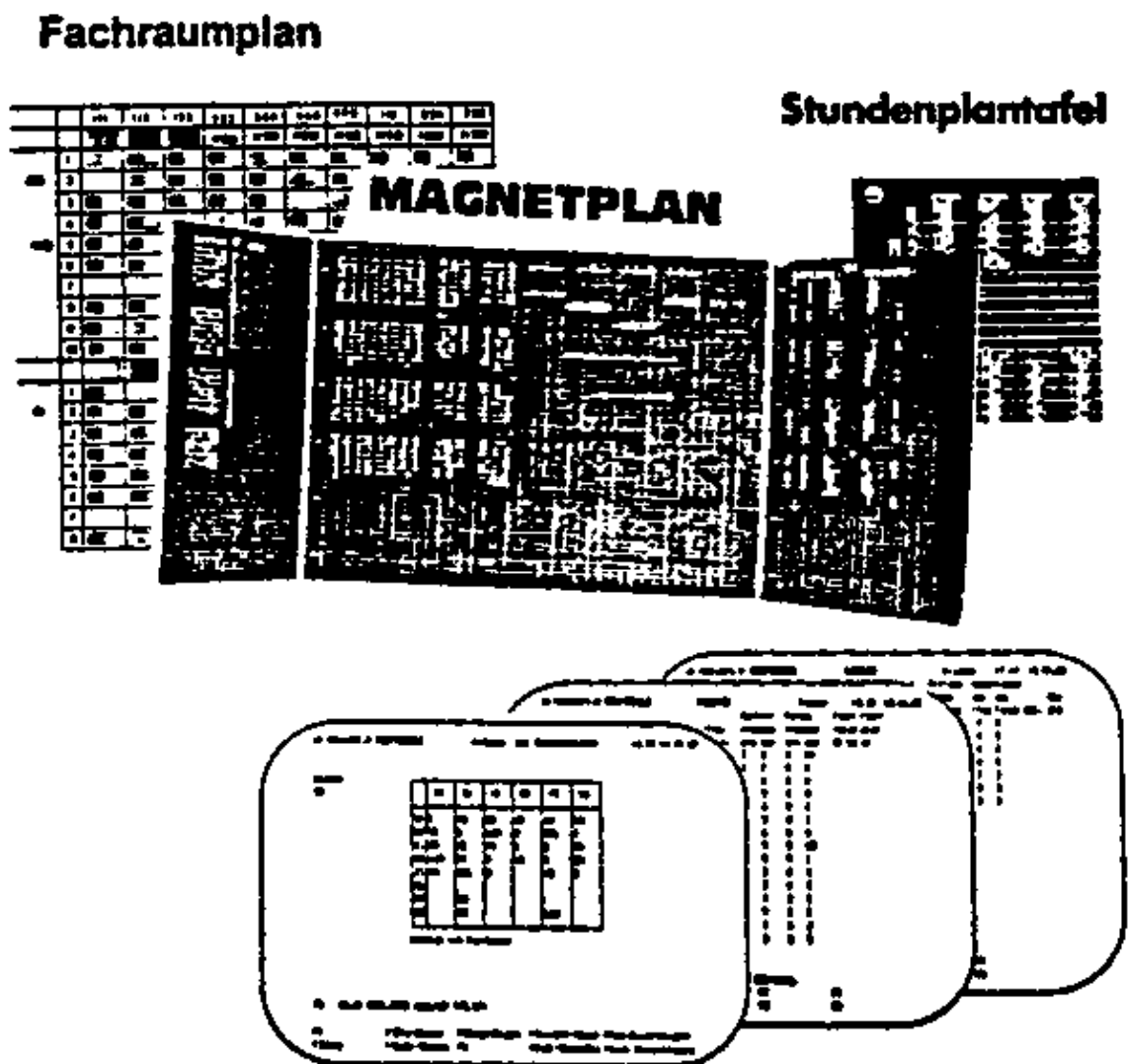
Care must be taken to return to the actual topic as soon as possible after any deviations.

### 8.3 Hints for Possible Practical Solutions to Tasks of School Organization

#### POSSIBLE PRACTICAL SOLUTIONS

A number of selected examples can give seminar participants a limited insight into what practical experience has been gained in using partly standardized aids to organization at different types of educational establishment.

This insight includes organizational wall charts and their use, together with the modern form of administration with the assistance of data storage media.



This Section merely has the purpose of making participants aware that such organizational aids can be used to visualize the current status of:

- Type and number of rooms and their allocation;
- Type and number of classes according to different specialization;

- Type and number of workshop groups according to areas of specialization;
- Number of teachers and their deployment;
- Teaching subjects and their sequence;
- Course of training/timetable.

Besides these data, it is also possible if computers are used to include in this list further elements of school organization concerning the keeping of records, such as:

- Personal data of teachers, students/pupils and other employees at the training establishment;
- Certificates and results of examinations;
- Material throughput, and various other aspects.

One extremely big advantage in this system is the fact that each individual item of information can be recalled in the shortest possible time, and administration can be simplified considerably by the possibility of printing out such information.

## **8.4 Final Discussion and Conclusion**

### *FINAL DISCUSSION*

The organization of this obligatory section of every seminar must be left to the discretion of the person leading the seminar, or to the director of the institution in question.





**NAME**

(Please underline surname)

\_\_\_\_\_

**PROFESSION**

\_\_\_\_\_

**AREA OF SPECIALIZATION**

\_\_\_\_\_

**HOME COUNTRY**

\_\_\_\_\_

\_\_\_\_\_

● How long have you been in the  
Federal Republic of Germany?

\_\_\_\_\_

● Is this your first visit?  
(If not, when was your first  
visit?)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

● What is your function at  
your school?

\_\_\_\_\_

● For which occupations is  
training conducted at your  
school?

\_\_\_\_\_

\_\_\_\_\_

● How many students are  
trained per year?

\_\_\_\_\_

● How long do the courses of  
training last?

\_\_\_\_\_

● What are the entrance re-  
quirements for students?

\_\_\_\_\_

● What form of certificate/  
diploma can students attain?

\_\_\_\_\_

● Is this government-recognized?

\_\_\_\_\_

● How many teachers and instructors  
are employed at your school?

\_\_\_\_\_

● In what form of planning work  
have you already taken part  
in the school sector?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Worksheet No. 1





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Worksheet No. 2





Schedule of classes

	School year 1				School year 2				School year 3				
	hrs per wk		hrs per yr		hrs per wk		hrs per yr		hrs per wk		hrs per yr		
	T	P	T	P	T	P	T	P	T	P	T	P	
General education sector:													
Applications-oriented scientific sector:													
TMaths													
MTechn.													
WStudy													
TDrawing													
Practical technical sector:													
Total													

REMARKS:

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Rooms required

Room designation	Occupation per wk in hrs				Quantity
	School yr 1	School yr 2	School yr 3	Total	

REMARKS:

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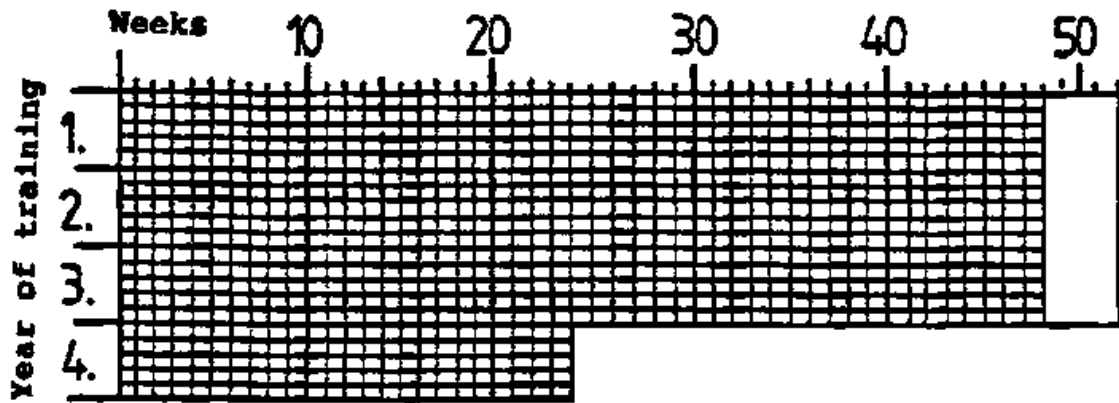
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Worksheet No. 3





Periods of training



Remarks:

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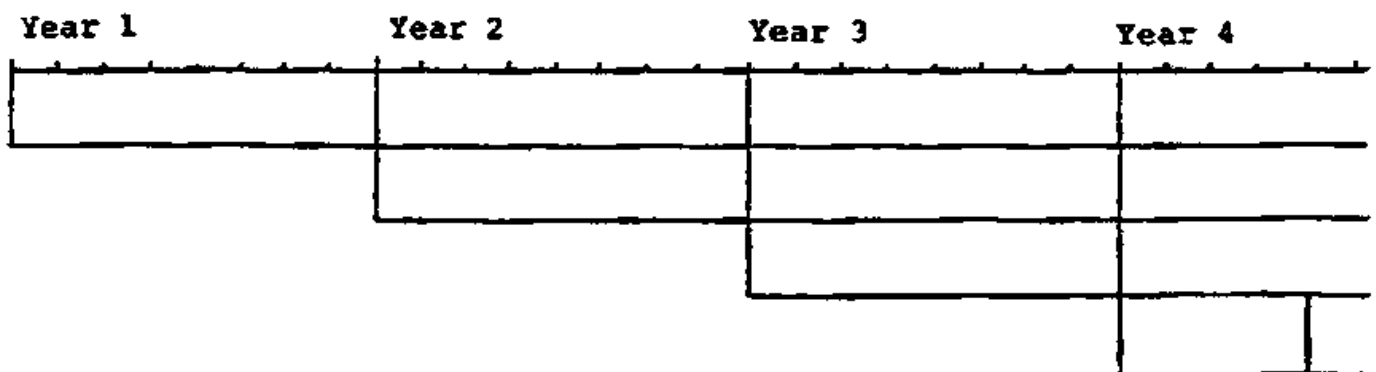


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Training cycle



Theory

School

Techn.Pr.

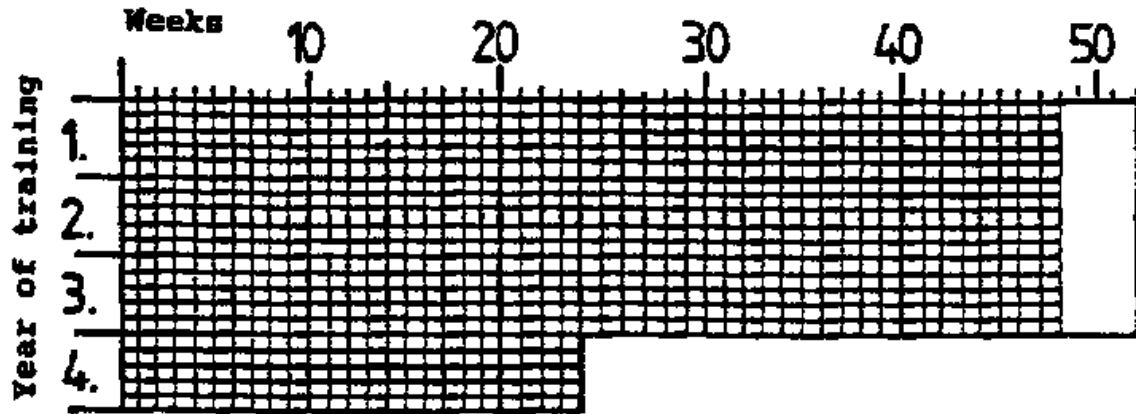
Firm

Worksheet No. 4





Periods of training



Remarks : \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Training cycle

Year 1	Year 2	Year 3	Year 4

Theory School

Techn.Pr. Firm

Worksheet No. 5





Schedule of classes  
(Overview)

Department \_\_\_\_\_

Length of training in years \_\_\_\_\_

Weeks per year \_\_\_\_\_

Hours per week \_\_\_\_\_

Hours per week	Year 1 of training	Year 2 of training	Year 3 of training
10			
20			
30			
40			

Worksheet No. 6





Worksheet No. 7





ROOMS REQUIRED

General Sector

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Theoretical Sector

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Practical Sector  
Workshops

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Laboratories

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Miscellaneous

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Worksheet No. 8





Worksheet No. 9





Worksheet No. 10











How do I plan the allocation of rooms and timetables?

Worksheet No. 12

Allocation of Rooms (Overall View)	Areas of Specialization (Occupation in hours)						Occup. in hrs per wk	Requ. Qty.	Utilization in %
	BS	ASI	ASII	BS	ASI	ASII			
Rooms Theory									
Workshops									
Laboratories									

Worksheet No. 12











Worksheet No. 14





PLAN OF CLASSES - OVERVIEW

	Class		Class		Class	
	Subject	Place	Teacher	Subject	Place	Teacher
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

	Class		Class		Class	
	Subject	Place	Teacher	Subject	Place	Teacher
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						





**Vocational Education**

(Reference)

Recognized trainee occupations  
in industry, trade, crafts  
and transport

Consolidation of initial training

(Section 25, Paragraph (1) Vocational Training Act)  
(Section 25, Paragraph (1) Handicrafts Regulation Act)

List of organization resources

- industry, trade and transport only -  
(Section 108, Paragraph (1) Vocational Training Act)  
plus list of syllabuses and timetables  
(Section 4, Paragraph (1) Vocational Training Act)

Recommendations by Federal Institute for  
Vocational Training Affairs (BIBB)

Regulations for advanced further training

Overall syllabuses and  
special legal provisions  
(Advanced further training in commercial occupations)

- As of 1 July 1986 -

W. BERTELSMANN VERLAG KG D-4800 BIELEFELD 1

Reference Sheet No. 1





How do I plan the allocation of rooms and timetables?

Reference Sheet No. 2

OCCUPATIONAL FIELD

AREA OF SPECIALIZATION

INDIVIDUAL OCCUPATIONS

METAL

CONSTRUCTIONAL METALWORKING

- 2620 Pipe layer
- 2622 Plumber, gas and water connections
- 2631 Utility pipe systems engineer, Pipe systems engineer
- 6350 Draftsmen, engineering (sanitary)

AUTOMOTIVE ENGINEERING

- 2811 Automobile mechanic, Automobile body shop mechanic
- 1441 Vulcanizer

MECHANICAL ENGINEERING

- 2730 Mechanic and installer/machine fitter
- 2739 Millwright
- 2740 Salaried locksmith
- 2850 Mechanic
- 1510 Plastics molder
- 2859 Parts fitter
- 2910 Toolmaker
- 2912 Mold maker, steel casting

WOOD

- 5010 Wood mechanic
- 5010 Joiner
- 5013 Cabinet-maker
- 5031 Wheelwright, cartwright

BUILDING

CARCASS

- 4410 Skilled worker, superstructures
- 4410 Bricklayer
- 4413 Fireplace and chimney builder
- 4420 Concrete and reinforced-concrete worker

FINISHINGS AND SERVICES

- 4830 Tile, plate and mosaic setter
- 4861 Floor layer, plastered stone

PAINT

- 5110 Painter and lacquerer
- 5121 Lacquerer, wood and metal
- 5133 Gilder
- 5140 Glass and porcelain painter 08

Reference Sheet No. 2





**CHARACTERISTICS OF TYPES OF TECHNICAL ROOM**

Occupational field of metal engineering

Areas and volumes in every building are to be determined in accordance with DIN 277.

TYPE OF ROOM	PLACES	AREA approx.	AREA/ PLACE	ADDITIONAL AREAS	USER GROUPS
<b>ASL</b> Assembly laboratory	12	100	8.3	- Collection area/preparation - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Emphasis on production and cutting techniques - Occup. grp. mechanics
<b>MEL</b> Mechanics laboratory	30	100	3.3	- Collection area/preparation	<u>Basic vocat. education/ training year</u> - Joint basic training - Emphasis on production and cutting techniques - Advanced techn. stage - Occup. grp. mechanics
<b>CL</b> Control engineering laboratory	24	100	4.2	- Collection area/preparation	<u>Advanced techn. stage</u> - Occup. grp. mechanics - Occup. grp. installation and metal construction techniques - Occup. grp. agricultural machine mechanics
<b>MTL</b> Metalworking laboratory	30	100	3.3	- Collection area/preparation	<u>Basic vocat. education/ training year</u> - Joint basic training - Advanced techn. stage - Occup. grp. mechanics - Occup. grp. installation and metal construction techniques - Occup. grp. agricultural machine mechanics
<b>AUL</b> Automobile laboratory	24	120 1100 → 20t	5.0	- Collection area/preparation (bulky automobile parts) - Changing/wash-rooms - Automobile storage area	<u>Basic vocat. education/ training year</u> - Emphasis on automotive engineering - Advanced techn. stage - Occup. grp. agricultural machine mechanics - Occup. grp. bodywork construction engineering
<b>III</b> Installation and heating laboratory	24	100	4.2	- Collection area/preparation	Advanced techn. stage - Occup. grp. installation and metal construction techniques

TECHNICAL ROOM FITTINGS FOR VOCATIONAL SCHOOLS

TYPE OF ROOM	PLACES	AREA approx.	AREA/ PLACE	ADDITIONAL AREAS	USER GROUPS
<b>W</b> Workshop	12	60	5.0	- Materials storage/preparation - Collection area for student work - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Main user group underlined in each case
<b>W</b> Machine workshop	24	100	4.2	- Materials storage/preparation - Collection area for student work - Tools preparation - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Joint basic training - Emphasis on production and cutting techniques
<b>W</b> Welding workshop	12	170	14.2	- Materials storage/preparation - Collection area for student work - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Joint basic training - Emphasis on installation and metal construction techniques
<b>W</b> Welding workshop	24	140	5.8	- Materials storage/preparation - Collection area for student work - Storage ancillary equipment - Cylinder storage - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Joint basic training - All 3 main fields - Advanced techn. stage - Occup. grp. mechanics - Occup. grp. installation and metal construction techniques - Occup. grp. agricultural machine mechanics
<b>W</b> Automobile workshop	12	180	15.0	- Collection area/preparation (bulky automobile parts) - Battery room - Weather- and thief-proof area for practice car - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Emphasis on automotive engineering - Advanced techn. stage - Occup. grp. agricultural machine mechanics - Occup. grp. bodywork construction engineering
<b>W</b> Machine workshop	24	180	7.5	- Materials storage/preparation - Collection area for student work - Tools preparation - Changing/wash-rooms	<u>Basic vocat. education/ training year</u> - Joint basic training - Emphasis on production and cutting techniques - Advanced techn. stage - Occup. grp. mechanics - Occup. grp. installation and metal construction techniques

SAL Study 59

Reference Sheet No. 3





LIST OF ROOMS

No.	Qty.	Utilization/Rm. Designat.	m <sup>2</sup> /Unit	Total m <sup>2</sup>
1	2	3	4	5
<b>Trade School I</b>				
<b>General Teaching Sector/ Technical Theory</b>				
1	40	Classrooms <sup>21</sup>	68.0 <sup>31</sup>	2718.2
2	23	Teacher Preparat. + Teaching Mat.	27.5 <sup>31</sup>	631.5
3	3	Central Teaching Mat.	48.5	145.5
4	1	Teaching Mat. + Copying	19.5	19.5
5	1	Language Laboratory	87.5	87.5
				<b>3602.2</b>
<b>Information Sector</b>				
6	1	Centr. Teaching Mat./Maps/Copying	270.2	270.2
7	1	Student Workroom	65.3	65.3
8	1	Student Representation	19.5	19.5
9	1	Library + Reading Room	141.6	141.6
10	1	Centr. Teaching Mat.	103.5	103.5
11	1	Centr. Teaching Mat.	54.0	54.0
				<b>654.1</b>
<b>Techn. Practice Workshop Sector</b>				
12	1	Workshop Interior Decorators, Upholsterers	97.4	97.4
13	1	Plucking Room	10.3	10.3
15	1	Workshop Interior Decorators, Decorators	126.8	126.8
16	1	Wood Workshop	117.1	117.1
17	1	Metal Workshop	117.1	117.1
18	6	Storerooms	73.0	73.0
19	2	Teachers' Rooms, Preparation	21.5	43.0
				<b>584.7</b>
<b>Young Workers/Interior Decorators</b>				
20	1	Workroom	59.6	59.6
21	1	Workroom	136.9	136.9
22	1	Painters' Room	117.0	117.0
23	1	Painters' Room	236.6	236.6
24	1	Grinding Room	67.7	67.7
25	2	Spraying Rooms	33.4	66.8
26	1	Drying Room	53.3	53.3
27	1	Paint Laboratory	48.0	48.0
28	1	Screen Printing Painters	41.5	41.5
29	7	Storerooms	162.9	162.9
30	2	Teachers Preparation	46.0	92.0
				<b>1035.9</b>
<b>Printers/Windup-Dressers</b>				
31	1	Plastics Laboratory	62.4	62.4
32	2	Benchroom Wood	134.0	268.0
33	1	Equipment Room/Gluing Room	67.7	67.7
34	1	Welder Room	15.9	15.9
35	1	Sharpening Room	21.4	21.4
36	1	Drying Room	38.1	38.1
37	1	Saw Wood	38.5	38.5
38	1	Machine Room I, Wood	97.4	97.4
39	1	Machine Room II, Wood	196.6	196.6
40	1	Shed <sup>31</sup>	136.3	136.3
41	1	Large Marking Floor	276.4	276.4
42	1	Small Marking Floor	117.1	117.1
43	1	Benchroom Wood	117.1	117.1
44	2	Teachers Preparation	26.4	52.8
45	1	Room for Hardware	8.0	8.0
46	1	Room for Models	10.7	10.7
47	1	Benchroom Wood	110.6	110.6
48	2	Finishing/Coating Rooms	40.0	80.0
49	1	Lanouer Storeroom	8.9	8.9
				<b>1657.5</b>
<b>Wood</b>				
50	1	Workshop Wet Plaster, Gypsum, Stucco	185.7	185.7
51	1	Workshop Ready-mixed Plaster	62.9	62.9
52	1	Materials Testing Room	337.1	337.1
53	1	Concrete Laboratory	136.9	136.9
54	1	Workshop Concrete + Bricklayers	263.0	263.0
55	1	Modelling	41.5	41.5
56	2	Workshop Concrete + Bricklayers	224.0	448.0

No.	Qty.	Utilization/Rm. Designat.	m <sup>2</sup> /Unit	Total m <sup>2</sup>
1	2	3	4	5
57	1	Metal Workshop	110.9	110.9
58	2	Teachers Preparation	—	48.0
59	5	Storeroom	—	62.6
60	1	Scaffold Store <sup>51</sup>	65.8	65.8
61	1	Brick Store	68.1	68.1
				<b>1630.5</b>
<b>Building</b>				
62	1	Modelling + Gypsum Room	136.9	136.9
63	1	Modelling Room	117.1	117.1
64	1	Wood Carvers	48.0	48.0
65	1	Marking Floor	38.3	38.1
66	1	Workshop Stonemasons	266.5	266.5
67	1	Teachers Preparation	28.2	28.2
68	1	Storeroom	7.7	7.7
69	1	Factory Shed	140.4	140.4
				<b>782.9</b>
<b>Sculptors - Stonemasons</b>				
70	var.	Changing, Washrooms + WC's for Workshops	—	640.0
				<b>6331.5</b>
<b>Techn. Practice Workshop Sector</b>				
<b>Science Teaching Sector</b>				
71	1	Preparation Chemistry	68.0	68.0
72	1	Lecture Theatre Chemistry	67.7	67.7
73	1	Lecture Theatre Physics	67.7	67.7
74	1	Preparation Physics	87.7	87.7
75	1	Demonstration Physics	67.7	67.7
				<b>358.8</b>
<b>Science Teaching Sector</b>				
<b>Central Sector</b>				
76	3	Recreation Rooms	—	252.8
77	1	Cafe (Kiosk)	18.6	18.6
78	2	Rooms for Religious Worship <sup>61</sup>	68.0	68.0
79	1	Teachers' Room + Collection	23.2	23.2
				<b>430.6</b>
<b>Central Sector</b>				
<b>Administration Sector</b>				
80	1	Conference Room	144.1	144.1
81	1	Teachers' Library	47.8	47.8
82	1	Registry	30.5	30.5
83	1	Copying	16.1	16.1
84	1	Parents + First Aid	21.7	21.7
85	3	Heads of Department	—	38.0
86	1	Principal	23.1	23.1
87	1	Vice-Principal	20.7	20.7
88	1	Secretary's Office	41.8	41.8
89	1	Caretaker	18.7	18.7
				<b>402.5</b>
<b>Administration Sector</b>				
<b>Trade School I</b>				
				<b>11779.7</b>
<b>Trade School IV<sup>71</sup></b>				
<b>Information Sector</b>				
90	1	Library, Reading Room <sup>81</sup>	142.0	142.0
91	2	Central Teaching Mat. <sup>81</sup>	170.9	341.8
92	1	Music Room	82.5	82.5
93	1	Auxiliary Music Room	12.0	12.0
				<b>407.4</b>
<b>Information Sector</b>				
<b>Techn. Practice Workshop Sector</b>				
94	1	Printers Planning	—	—
95	2	Teachers/Preparation	—	—
96	1	Lead Composition	—	—
97	2	Auxiliary Rooms	—	—
98	1	Copying Room	—	—
99	2	Laboratories	—	—
100	1	Planographic Plate Printing	—	—
101	1	Photo Composition	—	—
102	1	Flatbed Offset	—	—
103	1	Letterpress Printing	—	—
104	1	Colour Printing/Moulds	—	—

Reference Sheet No. 4





**Schedule of Classes** Basic Stage (1st Training Year) Metalworking

Sector/Subjects	Hours per Week				
	Vocational School		1-yr Specialized Vocational School		
	Basic Vocational Ed./ Training Year (BGT)	Part-Time Teaching			
<b>Interdisciplinary Study Sector</b>					
General Education Sector	7		4		5
Religious Instruction		1		1	1
German		2		1	1
Social Studies		1		1	1
Economics		1		1	1
Sport		2		-	1
<b>Occupational Field Study Sector</b>					
Technical Theory Sector	9		7		9
Technical Instruction		4		3	4
Technical Mathematics		1.5		1	1.5
Technical Drawing		1.5		1	1.5
Practical Technical Instruction		2		2	2
Technical Practice Sector	22		-		24
Technical Practice Related to Occup. Field		16		-	16
Technical Practice Related to Specializ.		6		-	6
<b>Optional Subjects Sector</b>					
Optional Subjects	2		2		2
Optional Subjects		2		2	2
<b>Total</b>	<b>40</b>		<b>13</b>		<b>40</b>

Stage (Year of Training)	Units in Curriculum	Recommended Hours	Total Hours
Basic Stage (1st year of training)	<b>Technical Instruction</b>		160
	1.1 Testing I	6	
	1.2 Separation	4	
	1.3 Machining I	4	
	1.4 Machining II	17	
	1.5 Non-Cutting Shaping	6	
	1.6 Joining	12	
	1.7 Fundamentals of Chemistry and Physics	20	
	1.8 Materials	15	
	1.9 Electrical Engineering I	6	
	1.10 Production and Cutting Techniques*	30*	
	1.11 Installation and Metal Construction Techniques*	30*	
	1.12 Automotive Engineering*	30*	
Time for tests and possible reinforcement classes	40		
<b>Technical Mathematics</b>			60
1.1 Fundamentals of Mathematics	10		
1.2 Fundamentals of Technical Mathematics	35		
Time for tests and possible reinforcement classes	15		
<b>Technical Drawing</b>			60
1.1 Fundamentals of Technical Drawing	20		
1.2 Standardized Representation of Components	25		
Time for tests and possible reinforcement classes	15		
<b>Practical Technical Instruction</b>			80
1.1 Testing	6		
1.2 Machining	22		
1.3 Non-Cutting Shaping	6		
1.4 Joining	20		
1.5 Materials	6		
Time for tests and possible reinforcement classes	20		
<b>Technical Practice Related to Occup. Field</b>			640
1.1 Introduction	8		
1.2 Testing I	24		
1.3 Marking/Identification	20		
1.4 Separation	15		
1.5 Machining I	100		
1.6 Machining II	160		
1.7 Non-Cutting Shaping	45		
1.8 Joining	160		
1.9 Changing Properties of Materials	8		
1.10 Production	100		
<b>Technical Practice Related to Specialization<sup>1)</sup></b>			240
1.1 Production and Cutting Techniques*	240*		
1.2 Installation and Metal Construction Techniques*	240*		
1.3 Automotive Engineering*	240*		

Reference Sheet No. 5





**Schedule of Classes**

(Advanced Technical Stages I and II)

Subjects	Hours per Week	
	Adv. Techn. Stage I	Adv. Techn. Stage II
<u>General Education Sector</u>	4	4
Religious Instruction	1	1
German	1	1
Social Studies	1	1
Economics	1	1
<u>Technical Theory Sector</u>	7	7
Technical Instruction	2	2
Technical Mathematics	1.5	1.5
Technical Drawing	1.5	1.5
Practical Technical Instruction	2	2
<u>Optional Subjects Sector</u>	2	2
Optional Subjects	2	2
Hours per Week	13	13

OUTLINE CURRICULUM AND TIMETABLE

**Advanced Technical Stage I**

No.	Subject	Curriculum Unit	Recommended Hours					Total Hours
			TI	IM	TD	PTI	TP	
	Technical Instruction incl. Practical Technical Instruction							120
2.1		Various and Casting Materials	5			4		
2.2		Heat Treatment - Changing Properties of Materials	9			10		
2.3		Materials Testing	7			10		
2.4		Cutting Edges and Cutting Materials	7			8		
2.5		Turning	6			6		
2.6		Milling	4			4		
2.7		Breaching	1			-		
2.8		Cylindrical and Surface Grinding	4			4		
2.9		Kinds of Fit	5			6		
2.10		Testing II	6			4		
2.11		Machine Elements I	6			4		
	Technical Mathematics							45
2.1		Trigonometric Functions		3				
2.2		Cones and Conical Turning		6				
2.3		Separation with Dividing Head		5				
2.4		Law of Forces		12				
2.5		Transmission and Dimensions in Belt and Gear Drive		14				
	Technical Drawing							45
2.1		Standardized Representation of Components			30			
2.2		Additional Specifications in Drawings			5			
2.3		Breakdown Drawing from Total Drawing			10			
		Progress Testing, etc.	20	15	15	20		70
		Total Teaching Hours	80	60	60	80		380







Outline Curriculum **Advanced Technical Stage II**

Stage (Year of Training)	Units in Curriculum	Recommended Hours	Total Hours
Advanced Stage II (3rd year of training)	<u>Technical Instruction</u>		80
	3.1 Corrosion and Corrosion Protection	4	
	3.2 Sintered Materials (Composite Materials)	2	
	3.3 Non-Ferrous Metals II (Alloys)	5	
	3.4 Plastics II	5	
	3.5 Fine Machining	2	
	3.6 Pneumatic and Hydraulic Control Systems	9	
	3.7 Machine Elements II	8	
	3.8 Separation	5	
	3.9 Non-Cutting Shaping II	4	
	3.10 Electrical Engineering II	4	
	3.11 Joining II - Welding	6	
	3.12 Copying Control + MC Control Systems	6	
Time for tests and possible reinforcement classes	20		
	<u>Technical Mathematics</u>		60
3.1 Work, Power, Efficiency	12		
3.2 Hydraulics and Pneumatics	9		
3.3 Fundamentals of Strength Calculation	12		
3.4 Primary Machine Time, Job Costing	12		
Time for tests and possible reinforcement classes	15		
	<u>Technical Drawing</u>		60
3.1 Standardized Representation of Components	10		
3.2 Symbolic Representation in Drawings	10		
3.3 Breakdown Drawing from Total Drawing	25		
Time for tests and possible reinforcement classes	15		
	<u>Practical Technical Instruction</u>		80
3.1 Corrosion Protection	4		
3.2 Plastics	10		
3.3 Control Systems	18		
3.4 Machine Elements II	8		
3.5 Separation and Non-Cutting Shaping	10		
3.6 Joining II - Welding	10		
Time for tests and possible reinforcement classes	20		
Total			280







**Schedule of Classes Automotive Engineering**

Subjects	Hours per Week	
	Advanced Techn. Stage I	Advanced Techn. Stage II
<u>General Education Sector</u>	4	4
Religious Instruction	1	1
German	1	1
Social Studies	1	1
Economics	1	1
<u>Technical Theory Sector</u>	7	7
Technical Instruction	2.5	2.5
Technical Mathematics	1.5	1.5
Technical Drawing	1	1
Practical Technical Instruction	2	2
<u>Optional Subjects Sector</u>	2	2
Optional Subjects	2	2
Hours per Week	13	13

**Outline Curriculum Advanced Technical Stages I and II**

Advanced Technical Stage I (2nd Year of Training)	<u>Technical Instruction</u>		100
	2.1 Four-Stroke Spark-Ignition Engines	45	
	2.2 Two-Stroke Spark-Ignition Engines	5	
	2.3 Electrical System of the Motor Vehicle	15	
	2.4 Supplementary Materials Technology	10	
	Time for tests and possible reinforcement classes	25	
	<u>Technical Mathematics</u>		60
	2.1 Calculation: Motor Vehicle Engines	35	
	2.2 Calculation: Electrical System of the Motor Vehicle	10	
	Time for tests and possible reinforcement classes	15	
	<u>Technical Drawing</u>		40
	2.1 Breakdown Drawings and Total Drawings	20	
	2.2 Diagrams and Diagrammatic Sections	10	
	Time for tests and possible reinforcement classes	10	
	<u>Practical Technical Instruction</u>		80
	2.1 Four-Stroke Spark-Ignition Engines	32	
	2.2 Electrical System of the Motor Vehicle	16	
	2.3 Joining, Changing Properties of Materials	12	
	Time for tests and possible reinforcement classes	20	
	<b>Total</b>		<b>280</b>

Advanced Technical Stage II (3rd Year of Training)	<u>Technical Instruction</u>		100
	3.1 Four-Stroke Diesel Engines	15	
	3.2 Power Transmission	25	
	3.3 Chassis	30	
	3.4 Safety in the Motor Vehicle	5	
	Time for tests and possible reinforcement classes	25	
	<u>Technical Mathematics</u>		60
	3.1 Power Transmission and Drive Mechanics	28	
	3.2 Braking and Deceleration	17	
	Time for tests and possible reinforcement classes	15	
	<u>Technical Drawing</u>		40
	3.1 Breakdown Drawings and Total Drawings	20	
	3.2 Diagrams and Diagrammatic Sections	10	
	Time for tests and possible reinforcement classes	10	
	<u>Practical Technical Instruction</u>		80
	3.1 Four-Stroke Diesel Engines	10	
	3.2 Power Transmission	12	
	3.3 Chassis	30	
	Time for tests and possible reinforcement classes	20	







Outline Curriculum

Occupational Field: Electrical Engineering

Basic Stage

Field of Study	Teaching Hours			Total	%
01 Fundamental Quantities of the Electric Circuit	15	5	-	20 h	10 %
02 Resistive Circuits	11	10	3	24 h	11 %
03 Work, Power, Efficiency	7	7	2	16 h	8 %
04 Voltage Generators	4	3	-	7 h	4 %
05 The Static Magnetic Field	11	4	-	15 h	7 %
06 The Static Electric Field	6	4	-	10 h	4 %
07 Fundamentals of Algebra and Trigonometry	-	15	8	23 h	11 %
08 Fundamentals of Physics	20	18	-	38 h	18 %
09 Fundamentals of Chemistry	15	2	-	17 h	8 %
10 Fundamentals of Materials Technology	10	-	-	10 h	4 %
11 Fundamentals of Technical Drawing	-	-	30	30 h	15 %
Total time spent on teaching and initial practice	99 h	68 h	43 h	210 h	100 %
Tests, Revision, etc.				70 h	

Technical Theory Sector (TTS)

Mathematics with Technical Mathematics (TM)	(2)	}	8
Technical Drawing with Geometry (TD)	(2)		
Technical Theory (Work Study, Materials Technology, Chemistry, Physics) (TT)	(4)		
Technical Theory Elective Option			2
			<u>8 + 2</u>

Technical Practical Sector (TPS)

Technical Practice (TP)	19
Technical Laboratory/Measuring and Switching Exercises (TL)	3
Technical Practice Elective Option	2
	<u>22 + 2</u>













Outline Curriculum

**Electrical Engineering**

**Power Engineering  
Advanced Technical Stage II**

Field of Study	Study Unit	EST/EF	ET-NV/EE-S	EM-BV/(C-EN)	Hours		
01 Transformers	01.1 AC Transformers	14	14	14	14	(14)	
	01.2 Structure and Materials						
	01.3 Special Types (AC Transformers)						
	01.4 Three-Phase Transformers						
02 Three-phase machines	02.1a Operational Performance of Three-Phase Synchronous Motors	12	12	30	30	(30)	
	02.1 Slip-Ring Motors						
	02.2 Speed Regulation in Three-Phase Synchronous Motors						
	02.3 Synchronous Machines						
	02.4 Braking Operation						
	02.5 Three-Phase Windings						
03 Asynchronous motors on single-phase networks	03.1 (See Advanced Technical Stage I)	8	8	20	20	(20)	
	03.2 Capacitor Motors; Motor with Auxiliary Starting Winding						
	03.3 Split-Pole Motors						
	03.4 Star-Delta Circuit						
	03.5 Single-Phase Windings						
04 Commutator machines	04.1 Structure and Function of DC Shunt-Wound Machines	10	10	15	15	(20)	
	04.2 DC Shunt-Wound Motors						
	04.3 Series-Wound and Compound-Wound Motors						
	04.4 AC Commutator Machines						
	04.5 Windings						
05 General background to el. machines	05.1 Choice of Motors	15	15	20	20	(20)	
	05.2 Mechanical Power Transmission						
	05.3 Maintenance						
06 Switchgear and distribution systems	06.1 Types of Switch for Low Voltage	24	20	15	15	(5)	
	06.2 Contactors and Relays						
	06.3 Types of Contact and Contact Materials						
	06.4 Insulation Materials						
	06.5 Low-Voltage Switching and Distribution Systems						
07 Wires and line protection	07.1 Types and Models of Network	35	20	10	10	(5)	
	07.2 Low-Voltage Networks						
	07.3 Lines; Calculation and Design						
	07.4 Structure of Lines						
	07.5 Line Protection						
	07.6 Sealing Compounds, Cast Resins						
	07.7 Power-Factor Correction						

Field of Study	Study Unit	EST/EF	ET-NV/EE-S	EM-BV/(C-EN)	Hours		
08 Provisions, regulations, safety precautions	08.1 Outline and Importance	25	25	25	25	(15)	
	08.2 (See Advanced Technical Stage I)						
	08.3 Test Procedures						
	08.4 Special Rooms						
	08.5 Lightning Protection Systems						
09 Connecting techniques	09.1 Kinds of Fit, Surface Quality	8	30	30	30	(30)	
	09.2 Kinds of Solder and Spring Connections						
	09.3 Screw, Pin and Rivet Connections						
	09.4 Welded Connections						
10 Components and basic circuits in electronics	10.1 Principles of Semiconductor Technology	26	34	26	26	(15)	
	10.2 Transistors						
	10.3 Thyristors						
	10.4 Triac and Diac						
	10.5 Photoelectric Components						
	10.6 Oscilloscope						
	10.7 Logic Operations						
11 Principles of control engineering	11.1 Open-Loop Control Engineering	15	20	15	15	(5)	
	11.2 Closed-Loop Control Circuits						
	11.3 Discontinuous Controllers						
	11.4 Controlling Systems						
12 Electrical equipment	12.1 Materials and Structure of Radiators	16	16	8	8	(8)	
	12.2 Electric Ovens						
	12.3 Water Heaters						
	12.4 Electric Space Heaters						
	12.5 Refrigerating Equipment						
13 Principles of lighting and illumination	13.1 Quantities and Units	16	8	8	8	(8)	
	13.2 Light Sources (Thermal Radiators)						
	13.3 Light Sources (Cold-Light Radiators)						
	13.4 Simple Illuminating Systems						
14 Antenna techniques	14.1 Physical Principles	8	8	8	8	(8)	
	14.2 Antennas and Antenna Systems						







**Schedule of Classes**  
**Woodwork**  
**(Basic Stage)**

Subjects	Hours per Week Basic Stage Spec. Voc. School/ Basic Voc. Ed. Year
<u>General Education Sector</u>	7
Religious Instruction	1
Social Science	1
German	2
Technics	1
Sport	2
<u>Technical Theory Sector</u>	9
Technical Instruction	3
Technical Mathematics	4
Technical Drawing	2
Practical Technical Instruction	2
<u>Technical Practical Sector</u>	22
Technical Practice	20
<u>Optional Subjects Sector</u>	2
Optional Subjects	2
<b>Total</b>	<b>40</b>

Stage Year of Training	Curriculum Units	Recommended Hours	Total Hours
Basic Stage (1st Year of Training)	<u>Technical Instruction</u>		160
	1.1 Wood and Wooden Materials	27	
	1.2 Wood Joints and Wood Fasteners	20	
	1.3 Woodworking Tools and Machines	17	
	1.4 Glass	6	
	1.5 Metals	12	
	1.6 Electrical Engineering	7	
	Time for tests and possible reinforcement classes	30	
	<u>Technical Mathematics</u>		60
	1.1 Fundamentals of Mathematics	24	
	1.2 Lengths, Areas, Solids, Electrical Engineering	36	
	Time for tests and possible reinforcement classes	20	
	<u>Technical Drawing</u>		60
	1.1 Principles of Technical Drawing	20	
	1.2 Projection and Working Drawing	40	
	Time for tests and possible reinforcement classes	20	
	<u>Practical Technical Instruction</u>		80
	1.1 Wood and Wooden Materials	10	
	1.2 Wood Joints and Wood Fasteners	18	
	1.3 Woodworking Tools and Machines	12	
	1.4 Glass	4	
	1.5 Metals	6	
	1.6 Wood Surface Treatment	6	
	Time for tests and possible reinforcement classes	20	
	<u>Technical Practice</u>		600
	1.1 Wood and Wooden Materials	80	
	1.2 Wood Joints and Wood Fasteners	300	
	1.3 Woodworking Tools and Machines	180	
	1.4 Wood Surface Treatment	20	
	1.5 Glass	60	
	1.6 Metals	60	
	1.7 Finishes	20	
	1.8 Supplementary Exercises on Courses 1.1 to 1.3	80	
			128







Schedule of Classes

**Wood**  
**(Advanced Technical**  
**Stages I and II)**

A. General Education Sector

Hours per Week

Religion	1	
German	1	
Social Studies	1	
Economics	1	
	<hr/>	4.0

B. Technical Theory Sector

Technical Instruction (with Chemistry and Physics)	2.0	
Technical Mathematics	1.5	
Technical Drawing	2.5	
Practical Technical Instruction	2.0	
	<hr/>	(8.0) 7.0*

C. Optional Subjects

2.0

Total

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13.0

Outline Curriculum

Subject Curriculum Unit	Techn. Instr.	Techn. Maths	Techn. Drawing	Pract. Techn. Instr.	Total
	TI	TM	TD	PTI	
Furniture Making II	12	4.5	32	29	77.5
Heat Insulation, Soundproofing, Fireproofing	10	4.5	--	--	14.5
Interior Finishing	7	6	20	--	33.0
Drying and Seasoning	4	4.5	--	6	14.5
Exterior Doors and Windows	9	7.5	18	--	34.5
Wood Surface Treatment	10	7.5	--	21	38.5
Building Services	4	7.5	--	--	11.5
Revision, Progress Testing, etc.	8	8	10	8	32.0
Total	64	68	80	64	256.0







**Vocational Training as  
... Electrical Systems Installer**

Length of Training: 2 Years

<p>1.a) <u>Materials Processing:</u>            Safety and health at work and accident prevention            Measurement procedure - test procedure            Marking, centre-punching, identification            Filing, sawing, chiselling            Shearing and punching            Drilling, countersinking, reaming            Manual thread-cutting            Tool grinding            Straightening, bending            Turning            Metal and plastics bending            Riveting            Screws, bolts and nuts            Hardening and tempering</p>	22	<p>2. Soft soldering, hard soldering, welding            Assembly of electr. apparatus and production facilities            Cabling and wiring up to 1 kV            Measuring and testing electr. quantities            Repair and maintenance of electr. systems            Final training for certificate</p>	<p>4 8 16 6 10 4</p>
		Weeks	
<p>b) <u>Basic Electrical Engineering Skills:</u>            Safety and health at work and accident prevention            Soft soldering            Insulated leads and cables            Preparation, finishing for assembly            Production of printed circuits            Wiring techniques            Switching techniques            Production of simple windings</p>	26	<p><b>... <u>Electronic Specialist, Thermal Equipment</u></b>            Length of Training 3 1/2 Years</p>	

**... Electronic Specialist, Power Plants**

Length of Training 3 1/2 Years

1. Electrical Systems Installer	96	1. Electrical Systems Installer	96
2. Training on different lifting appliances (structure, function and fault location)	3	2. Assembly of components, units equipment for power electronics Fitting of printed circuit boards Wiring of equipment and plug-in units, cable harnesses acc. to drawings and wiring diagrams Connection of leads, cables and busbars to distributing facilities and equipment acc. to circuit diagrams and mounting instructions.	45
3. Training in special-purpose mech. eng. apparatus with mech., pneumat. and hydraul. components	31	3. Measurement of current, voltage and power Use of oscilloscopes Testing of electr. function in power engineering equipment and facilities Adaptation of equipment and facilities to local service conditions Adjustment and balancing of various systems	12
4. Training in drawing office, reading circuit diagrams, drawing and drafting electrical circuits	6	4. Detecting and eliminating faults in power engineering and power electronics equipment and systems	6
5. Training in electronics	6	5. Maintenance of power engineering and power electronics equipment and facilities acc. to maintenance instructions	6
6. Training in welding	2	6. Preparation for examination	3
7. As required	6		
8. Training in detecting and eliminating faults in electr. systems and equipm.	15		
		134	







Vocational Training as AUTOMOBILE MECHANIC

Description of Trainee Occupation

(1) The vocational training common to both areas of specialization has the following skills and knowledge as minimum requirements:

1. Metalworking:

- a) Measuring, testing
- b) Marking, centre-punching
- c) Identification
- d) Filing
- e) Sawing
- f) Chiselling
- g) Shearing
- h) Riveting
- i) Drilling
- k) Countersinking
- l) Reaming
- m) Straightening, bending
- n) Manual thread-cutting
- o) Turning
- p) Soft and hard soldering
- q) Welding, flame-cutting
- r) Upkeep and repair of tools and facilities;

2. Measuring in order to establish faults and malfunctions:

- a) Measuring with gauge, compression gauge, fuel pump pressure gauge and vacuum gauge, rev-counter, dwell angle meter, measuring instrument and engine scope, oscilloscope and exhaust gas analyzer;
- b) Measuring with acid siphon;
- c) Measuring spark gap in plugs;
- d) Measuring with ohmmeter, voltmeter, ohmmeter, and testing leads and electrical system;

3. Repairing motor vehicles:

- a) Knowledge of drive, power transmission and chassis components and their function;
- b) Upkeep and maintenance work;
- c) Inspection work;
- d) Dismantling and replacing assemblies and parts, detecting cause of fault and rectifying damage;
- e) Elimination of simple faults in electrical system, knowledge of pertinent legal regulations;

4. Health and safety at work, and accident prevention.

	Year of Training		
	1	2	3
1. Metalworking:			
a) Measuring, testing			
b) Marking, centre-punching			
c) Identification			
d) Filing			
e) Sawing			
f) Chiselling			
g) Shearing			
h) Riveting			
i) Drilling			
k) Countersinking	26	12	
l) Reaming			
m) Straightening, bending			
n) Manual thread-cutting			
o) Turning			
p) Soft and hard soldering			
q) Welding, flame-cutting			
r) Upkeep and repair of tools and facilities;			
2. Measuring in order to establish faults and malfunctions:			
a) Measuring with gauge, compression gauge, fuel pump pressure gauge and vacuum gauge, rev-counter, dwell angle meter, measuring instrument and engine scope, oscilloscope and exhaust gas analyzer;	10	16	10
b) Measuring with acid siphon;			
c) Measuring spark gap in plugs;			
d) Measuring with ohmmeter, voltmeter, ohmmeter, and testing leads and electrical system;			
3. Repairing motor vehicles:			
a) Knowledge of drive, power transmission and chassis components and their function;			
b) Upkeep and maintenance work;			
c) Inspection work;	12	20	38
d) Dismantling and replacing assemblies and parts, detecting cause of fault and rectifying damage;			
e) Elimination of simple faults in electrical system, knowledge of pertinent legal regulations;			
4. Health and safety at work, and accident prevention.	Spread over all 3 years		







Vocational Training as MECHANIC  
MECHANIC AND INSTALLER/  
MACHINE FITTER

Measuring Filing Marking Chiselling, sawing Drilling, reaming, countersinking, thread-cutting Straightening, bending Riveting Spring winding Forging simple workpieces and tools Sharpening Soft and hard soldering Simple scouring and scraping Tempering Simple roughing and filing to size Drilling, reaming and countersinking of simple workpieces on column drilling machines	48 weeks
Simple work on milling machine Simple work on shaping machine Production of simple sub-assemblies, using basic skills taught, with increasing difficulty Assembly of small groups of units	48 weeks
Machining of workpieces in various materials to required fit and surface quality, assembly of parts to units Pre-machining, finishing and fitting together of parts for small appliances and small machines Assembly, testing and adjustment of small appliances and small machines Production of simple tools and devices for manufacturing appliances and machine components Repair of small appliances and small machines	48 weeks







**Vocational Training as MECHANICAL ENGINEER,**  
**STEEL STRUCTURES**

**DESCRIPTION OF TRAINEE OCCUPATION**

Length of training: 3 years

Vocational training has the following skills and knowledge as minimum requirements:

Weeks

**Manual Working of Materials**

Measuring, marking, centre-punching

Filing, chiselling, sawing

Drilling, countersinking, reaming

Manual thread-cutting

24

Punching, notching

Fitting together of parts

**Machining of Materials**

Turning

3

Milling

2

Shaping

1

**Joining Work**

8

**Non-Cutting Shaping**

12

Bending, straightening, edging

**Hot Shaping**

6

**Oxy-acetylene and Arc Welding**

12

**Production of Components**

24

**Working with Manual Electric and**

**Hydraulic Tools**

6

**Assembly**

36

**Hardening and Sharpening**

3

**Upkeep and Repair**

7

**Safety and Health at Work, Accident**

**Prevention and Work Hygiene**

Over entire period of training







Vocational Training as JOINER

Description of Trainee Occupation  
 Vocational training has the following skills and knowledge as minimum requirements:

	Year of Training		
	1	2	3
1. Safety and health at work, accident prevention	Over all 3 years	2	3
2. Practice of activities relating to work and plant organization	5	5	5
3. Use of wood and wooden materials	12		
4. Basic woodworking and wood-processing skills	5	9	
5. Use of glues, adhesives, cements	12	10	8
6. Making wood joints	4		3
7. Basic metal-processing skills	3	3	2
8. Working with plastic and glass	1	1	6
9. Mounting hardware and processing auxiliary materials	3	1	1
10. Producing and reading drafts and drawings according to currently valid standards		5	2
11. Veneer processing	2	2	2
12. Straightening, sharpening and repair of tools		2	2
13. Basic skills in operation and maintenance of mechanical, hydraulic and electric machines and equipment		2	2
14. Adjustment, operation and maintenance of machines, systems and appliances		2	
15. Manufacture of components and assembly of components to products		4	5
16. Treatment of wooden surfaces			6
17. Execution of structural and chemical wood preservation measures	1	1	5
18. Assembly of pre-fabricated components and products		1	5
		weeks	







**TRAINING OF AN EXPERT  
FOR MAINTENANCE OF MACHINES IN A PLANT/FACTORY**

Expert capable of handling, maintaining and - wherever necessary - repairing the machinery contained in a plant/factory with respect to its mechanical, hydraulic and electrical functions.

He should also be able to ensure the serviceability of the machines and installations for which he is responsible from the standpoint of economic principles.

A knowledge of languages is desirable.

In particular, this should extend to:

- ability to understand plans and drawings;
- knowledge of principles of business management;
- sound knowledge of accident prevention regulations and safety precautions;
- fault detection;
- planning, executing and recording maintenance and repair work;
- installing new machines and systems;
- planning acquisition and stockpiling of spares.





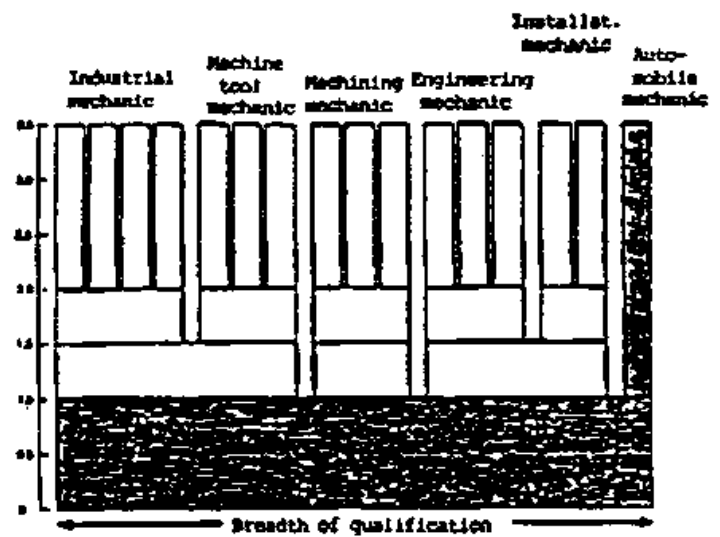


Vocational Training as TOOLMAKER

<p>Basic skills of metalworking Filing, chiselling, drilling and countersinking, manual thread-cutting, hammering, sawing, measuring, marking, connecting with screws and pins, riveting Simple vice work Producing simple tools and measuring instruments Simple forging work Beating out, upsetting, bending, punching, drop-forging, soft and hard soldering, hardening Vice work Including following skills: marking, reaming, scraping, grinding and fitting</p>	<p>48 weeks</p>
<p>Milling work Surfaces, gears, racks and moulds Planing work Surfaces (straight and sloping), grooves, projections, etc. Turning work Plain turning (rough and finish turning), recessing, surfacing, drilling, thread-cutting (initially as course work, then manufactured parts) Grinding work Surface, cylindrical, internal and tool grinding Vice work in production Work on marking table, simple gauges, individual parts for appliances, assembly and fit</p>	<p>48 weeks</p>
<p>In-house construction of fixtures In-house construction of jigs Depending on aptitude and inclination, it will be decided whether the apprentice should complete his/her training in the construction of fixtures or jigs. If he/she is particularly gifted, he/she will be transferred to making moulds for injection moulding Construction of fixtures or construction of jigs or construction of moulds</p>	<p>48 weeks</p>







**Duties and fields of activity**

Occup.	Special area	Duties	Object of activity	Field of activity
Auto-mobile mechanic		Repair, inspection, maintenance and equipping	Motor vehicles, including trailer vehicles	Mainly in repair workshops

**Automobile Body Shop Mechanic**

**Field of work**

- Repair of motor vehicles (cars, trucks and lorries, motorcycles):
- Detection of faults and damage in motor vehicles.
- Pre-machining and finishing of parts.
- Assembly, fitting and mounting of all sets of components.
- Correction of faults and removal of damage to motor vehicles, including electrical system.
- Testing and test driving of motor vehicles.
- Maintenance of motor vehicles.
- Care and upkeep of equipment, machines and facilities.

**Automobile Mechanic**

**Field of work**

On the basis of their training, automobile mechanics are qualified to undertake activity in the sector of motor vehicle repairs. Their duties include the repair, inspection, maintenance and equipping of motor vehicles, including trailer vehicles. The emphasis of their activities lies on:

- systematic fault finding in complex mechanical, pneumatic, hydraulic, electrical and electronic systems in motor vehicles
- assembly of components and adjustment of setpoint values, together with testing and assessing the function and condition of motor vehicle components and systems

These activities are conducted independently, mainly in repair workshops, paying due attention to







**Duties and fields of activity**

Occup.	Special area	Duties	Object of activity	Field of activity
Machine Tool Mechanic	Machine tool engineering	Manufacture, assembly, maintenance, inspection and repair	Cutting, non-cutting shaping + machining tools, appliances, gauges, templates, measuring + testing instruments	Individual parts production
	Mould engineering	Manufacture, assembly, maintenance, inspection and repair	E.g. Press, blowing, flask, compression, and injection moulds, casting dies, forging dies, impressions, and associated machining tools	Individual parts production
	Instrument engineering see below	Manufacture, assembly, maintenance inspection and repair	E.g. surgical, cosmetic or general-purpose instruments, implants and medical appliances	Series or individual parts production

**Mould Maker, Steel Casting**

**Field of work**

Production of permanent moulds or dies in steel and other metals, for casting (casting dies and pressure diecasting), forging or pressing of steel, other metals and organic or inorganic substances.

Production of related auxiliary devices.

Preparing moulds or dies for operation.

Production of test gauges.

Care and upkeep of tools and moulds, equipment and machines.

**Toolmaker**

**Field of work**

Production, adjusting and testing of cuts, presses, jigs, moulds, cutting and clamping tools and measuring instruments.

Maintenance of tools.

Care and upkeep of equipment, machines and facilities

**Metal Plate Engraver**

**Engraver, Roll Embossing**

**Steel Engraver, Die Maker**

**Steel Plate Engraver, Printing**

**Chaser**

**Note:**

Refer to previous regulations where necessary.

**Machine Tool Mechanic**

**Area of specialization: Mould engineering**

**Area of duties**

On the basis of their training, machine tool mechanics in the area of specialization of mould engineering are qualified to undertake activity in the sector of producing and maintaining moulds and dies.

Their duties include the manufacture, assembly, maintenance, inspection and repair of e.g. press<sup>58</sup> blowing, flask, compression and injection moulds, of casting dies, forging dies and impressions and the associated machining tools. The products are manufactured manually and by machine according to patterns or drawings with a high degree of accuracy to shape and dimension.

## **DSE in brief**

The German Foundation for International Development (DSE) was created by the Federal and Land governments in 1959 on the initiative of all the political parties represented in the Federal Parliament. It was assigned the task of fostering the relations between the Federal Republic of Germany and developing countries on the basis of a mutual exchange of experience. The DSE fulfills this mandate by organizing training programmes, seminars and conferences to support projects in countries of Africa, Asia and Latin America which serve economic and social development.

Since its creation, the DSE, in cooperation with national and international partner organizations, has provided more than 79000 experts and leading personalities from more than 140 countries with an opportunity to discuss issues of international development or undergo professional training.

In its work, the DSE attaches priority to rural development, food security and the promotion of industrial vocational training. It also supports efforts to improve organization and planning in developing countries in the fields of public administration, health, education and development planning. Furthermore, the DSE prepares German experts for their assignments in developing countries, and provides a comprehensive information and documentation service.

The DSE is based in Berlin, but it also has specialized centres at various locations in the Federal Republic of Germany:

**Berlin:** Executive Office, Development Policy Forum (EF), Development Information Centre (EPIZ), Central Administration, Economic and Social Development Centre (ZWS), Public Administration Promotion Centre (ZÖV)

**Bonn:** Education, Science and Documentation Centre (ZED)

**Bad Honnef:** Area Orientation Centre (ZA)

**Mannheim:** Industrial Occupations Promotion Centre (ZGB)

**Feldafing:** Food and Agriculture Development Centre (ZEL)

