

**EVALUATING
ACADEMIC READINESS
FOR APPRENTICESHIP TRAINING**
Revised for
ACCESS TO APPRENTICESHIP

**COMMUNICATIONS SKILLS
STRUCTURE RECOGNITION**

**AN ACADEMIC SKILLS MANUAL
for
The Precision Machining And Tooling Trades**

This trade group includes the following trades:
General Machinist, Tool & Die Maker,
Mould Maker, Pattern Maker, and
Machine-Tool Builder Integrator

*Workplace Support Services Branch
Ontario Ministry of Training, Colleges and Universities*

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In preparing these Academic Skills Manuals, we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or manual.

This trade related material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.

COMMUNICATIONS SKILLS

STRUCTURE RECOGNITION

*An academic skill required for the study of the
Precision Machining and Tooling Trades*

INTRODUCTION

If you look in the wrong places for information, you waste a lot of time and are frustrated by the process. If you use a method and the right guides as part of your technical reading tools, you get what you need efficiently and quickly.

Structure recognition means knowing where to look for information. It means knowing which guides to use to find what you want. Apply this idea to your manuals, textbooks, and handouts. When you can find information quickly, it saves you time. More importantly, it means you use the right information to perform a task.

Practical applications of recognizing structure of printed material includes such tasks as locating relevant information in textbooks, technical manuals, code books and municipal regulations; using the internet to search product catalogues and other supplier information; locating mathematic formulae, tolerances and other key information when interpreting job specifications. Knowledge of structure will help you to locate necessary information quickly and efficiently to successfully complete your task.

In this unit, we look at *structure recognition* to understand the following:

- ◆ The organization of technical material.
- ◆ How guides direct you to information.
- ◆ How to apply structure recognition.

PART I

ORGANIZATION OF TECHNICAL MATERIAL

Textbooks and manuals are organized so you know what's in them and can find what you want. If you understand the pattern of organization in your printed materials, you can make your search for information easier.

- ◆ Information is placed where it fits.
- ◆ It is labeled with chapter titles and headings.
- ◆ There is a consistent pattern that the text or manual follows.
- ◆ The main idea and details are presented in a logical sequence.

Organization: Textbooks and Manuals

You will know from a textbook title if the text is likely to be relevant to your trade. Once you have a text that covers the topics that you want to learn about, look at how it is organized.

Information in trade material is organized into themes or topics. Each topic is divided into more and more specific units. You will see a variety of ways for gathering and grouping information.

In a trade manual about occupational health and safety, you might see information divided into topics like the ones below.

Example:

PART I - PROCEDURES
PART II - EQUIPMENT
PART III - HAZARDS
PART IV - TRADE SPECIFICS

Under each of the Parts (I-IV above), you will find trade-related information about that topic; each topic will also be divided into more specific sections, sub-sections or chapters.

Example: Part III could be divided into topics such as these:

PART III - HAZARDS
1. Electrical
2. Confined Spaces
3. Asbestos

You will also see information divided by the level of difficulty, from basic through advanced. Each unit will depend on and build from the information in the one before it.

Example:

UNIT 1-12 – FUNDAMENTALS
UNIT 13-20 – INTERMEDIATE

Under headings such as those above, you will find information about topics grouped by trade, by level, and by the steps of learning.

Large topics are separated into smaller divisions and sub-divisions.

Example:

Tools and Safety
Unit 1 General Purpose Tools and Safety
Unit 2 Layout Tools
Unit 3 Power Tools
Unit 4 Safety Procedures

All of the information above relates to a kind of drawing used in your trade. As you read from the top down, you can see what you will cover in each section.

Example:

Tools and Safety – This is the large, broad topic.
Unit 1 General Purpose Tools and Safety – Safe use and handling of one class of tools.
Unit 2 Layout Tools – Safe use and handling of a second class of tools.
Unit 3 Power Tools – Safe use and handling of a third class of tools.
Unit 4 Safety Procedures – Procedures for situations involving tools of your trade

You can see that the information starts with a broad, general, topic and works toward narrower, more specific topics. You can also see what you are expected to learn in this unit. In student manuals, you often find questions or activities at the end of a unit (or chapter). These questions test what you have learned and let you review new material. Make use of them.

Become familiar with your textbooks and manuals by flipping through them. You will see the individual parts and the organization behind them. The more comfortable you become with structure recognition, the more quickly you will get the information you need.

PART II

GUIDES DIRECT YOU TO INFORMATION

To help you find what you want, we will look at six of the guides used in textbooks and manuals:

1. Table of Contents
2. Introduction
3. Summary
4. Glossary
5. Index
6. Appendix

1. The Table of Contents

Every textbook lists the contents at the beginning of the book. Pick up your text and leaf through the first pages. The Table of Contents can help you in two ways. It helps you become familiar with a new text, and it helps you find information faster.

When you read the Table of Contents, you can see what is ahead of you. It lists, by name, the sections and sub-sections, chapters and sub-chapters in the textbook; it also directs you to any additional material such as the index and appendix (more about these later).

A Table of Contents shows you the following information:

- ◆ chapter titles with page numbers,
- ◆ the order of the contents,
- ◆ the kinds of information you will study,
- ◆ how long various sections are,
- ◆ what comes first, second or last, and
- ◆ where you are now, where you are going, and where you have been.

Use the Table of Contents

Textbooks vary in style and layout, in language and diagrams, but the *Table of Contents* gives you a clear overview of the contents. Here are two ways of listing the same information in a Table of Contents.

Example 1:

CHAPTER 3

Layout Tools	10
Scribers	
Punches	
Dividers	
Trammels	
Protractors	
Combination Square	
Summary and Questions	

Example 2:

CHAPTER 3

Layout Tools	10
Scribers	12
Punches	13
Dividers	14
Trammels	15
Protractors	16
Combination Square	17
Summary and Questions	18

The two lists have the same headings, but the second gives you page numbers so it's easier to find the topics. You can find the page faster and you can tell how many pages are given to each of these topics. This will indicate how long you will need to spend examining a topic.

When you see the chapter and sub-chapter headings with page references you should know what's in the chapter. The same applies when you read the entire Table of Contents – you know what's in the book. This examination tells you if the manual will be useful, and what chapters will be most useful when you are looking for information.

Additional help

A *Table of Contents* may list the following sections that are commonly found in technical /information texts.

- Preface and/or Introduction
- Summary (Synopsis)
- Glossary (of trade terms)
- Appendix
- Index

If you don't see them listed, flip through a few chapters of your textbook. See if any (or all) of the above are in each chapter of your textbook. More importantly, check out what's in each.

2. Introduction and/or preface

The *introduction*, or *preface*, sets out guidelines, standards and conditions that let you know what you are going to be studying. It is found at the beginning of a text or at the beginning of each chapter. It outlines the objective of the text and sets you on the right track.

An introduction tells you the purpose of the text and who it is designed for.

Example:

This text introduces you to the fundamentals of layout, cutting, forming and fabrication. It is designed with questions and answers for students and apprentices.

An introduction refers to the basic information which will be in the text. It may explain why the information was chosen for the text, or why a specific part will be important to the reader, or why some information has not been included.

Example:

This text uses dual dimensioning throughout (US Customary: inch and metric: SI). Some measuring tools were not available in metric at the time of publication. In these cases, inch measurements are given with a *soft conversion* in parentheses ().

An introduction may also give you this kind of direction:

Example:

Basic techniques and safety procedures are explained in this chapter. Because this information will not be repeated in each chapter, refer to it when necessary.

The information above is clear. You will learn techniques in this chapter and then *it becomes a reference chapter*. You have been told where to find information and now it's up to you to refer to it.

An introductory note may be essential to your safety and to that of co-workers and customers. You must follow up on it.

Example:

Remember, these cautions are general. You must refer to a service manual for specialized and specific hazards!

These two examples have something in common: each tells you where to find instructions and to refer to them when appropriate. Your reading challenge is to develop a technique to remember where to find these directions when you need them. Maybe this is a place to put a tab or sticky note in the textbook; you might try a Table of Contents in your own notebook with page numbers for these special directions.

Take the time to look for and read the introductions. The introduction can help you successfully organize your approach to learning the material contained in the book. It may be general information, but it can contain essential, specific directions or set out conditions for success.

3. Summary (or synopsis)

The summary usually appears at the end of a chapter or section. It will be a brief outline, often in point form, of what the chapter covered. It reviews the key points and the object of the reading.

This is an excellent time for a self-test. If, at the end of the chapter, you can't remember information or key technical terms, review the necessary pages and test yourself again.

4. Glossary

A glossary is a mini-dictionary. It is an important section in every trade manual or text. In alphabetic order, it lists and defines trade and technical terms you need to master.

If the glossary is at the beginning of a chapter, you might review these words before you start reading. This review will tell you the terms you know and the ones you have to learn.

Always be careful to note when trade definitions are different from the way you understand a word.

Example: You understand and use the word *corrosion*, but you have to learn the trade definition. The glossary defines it this way:

Corrosion: Chemical or electrochemical reactions of metals and their surroundings which cause the metal to deteriorate and weaken. Rust, or “ferric oxide” (Fe₂O₃), is formed from the corrosion of iron.

Make sure you understand and remember these terms, as they will be a part of your work. A method for testing a new word is to see if you can explain it to someone who is new to the trade, or, imagine explaining it to a customer. If you can explain it, you have likely understood it. If not, go back to the glossary for a review.

Some texts may list *key terms*, or *trade terms* without definitions. Look at the words listed and make sure you understand and learn each word as you encounter it. You can develop your own glossary to review the list of new terms.

The glossary definition for *corrosion*, above, described what it is and what it does. A glossary may also include an abbreviation or chemical formula (Fe₂O₃) or give an abbreviation in full; it may give an alternate word (*rust*, or “*ferric oxide*” are examples), or a guide to look under another word.

Examples:

argon (Ar): One of four inert gases: Helium (He), Neon (Ne), and Xenon (Xe) are the others. Inert means the gas does not react chemically with other elements. Argon is commonly used as a shielding gas in welding as it is the most plentiful of the inert gases.

building code: Set of regulations or ordinances which govern construction standards in a community. *See also* Zoning.

hot-rolled steel (HRS): Steel finished or rolled into shape while still red hot: rough surface, dark blue grey. HRS is often referred to as black iron though this is incorrect.

Glossaries vary from text to text but they offer a lot of information. Become familiar with the glossary in your texts and manuals. It is an important tool for learning the language of your trade.

5. Index

The index is an alphabetic list of the topics in a book, with their page numbers. It is positioned at the end of the book and is designed to direct you to information. The index lets you see where every reference to a topic or term can be found in the book. This may be the most useful section of any book you use.

Index entries are single words or a few words and include page numbers (see the index entry in the table below) so you can immediately turn to the page or pages that have information about the entry. Large topics are divided into smaller topics and have sub-headings. For large topics like “*steel*” the list of index entries might go on for pages.

Index or Table of Contents?

Both the Table of Contents and the index direct you to information, but they are set up differently. Compare these index and Table of Contents entries:

Index entry - Sheet Metal	Table of Contents entry - Sheet Metal
Sheet Metal assembly, 9 fabrication, 12 galvanized, 18, 26-27, 32 hand tools, 6-10, 12-14, 15-16 installation, 9, 10 layout, 8 Etc.	Chapter 2 Sheet Metals Steel Sheet Metals 17 Coated and Solid 17 Galvanized 18 Stainless steel 19 Tin plate 19 Non-Ferrous Sheet Metals 20 Aluminum 22 Lead 23

As you compare the two, you can see that the index usually gives you a main topic broken into divisions that are smaller than in the Table of Contents. This should save you time when looking for a page or for more information:

Example:

Sheet metals, handling safety, 5

Although entries do not give you details about what you will find on these pages, you do know the topics. To find out exactly what's there and how useful it will be, you will have to turn to the exact page and read carefully.

If it's not in the index

If you can't find a word listed in the index, there may be no information or too little to be listed. Or, the word may be listed as a sub-topic or sub-category.

Example: You need instructions about drawing a part of a circle. You looked under the word *Drawing*, but did not find what you want. Under the word *Circles*, you find these sub-topics:

cutting inside,
drawing parts of,
stepping off equal divisions,
and so on ...

Sometimes information is *cross-referenced*. This means it is listed in two places under two different words. The entry may tell you where else to look: *See also* Circles, drawing or *See* Drawing. If you are stumped, ask someone for help. But, if you get stuck, try to understand the pattern used in the index so you can find what you need next time.

Occasionally, the book uses a different term from yours, or it may list an item such as drills or punches under a category: *equipment*. There is still a logical order, but, once again, you may need help to find the information. Usually, as you become familiar with a text or manual, you learn to “speak the same language” and finding information becomes easier.

6. The Appendix

The Appendix is a section used for additional information. It is usually, but not always, listed in the Table of Contents. It is usually, but not always, placed at the end of a text or manual; in some cases, it is at the end of a chapter. You may find it listed in this way:

Appendices 567

or, you may find each appendix listed in this way:

Appendix A: Tables 567-569
Appendix B: Decimal Equivalents of Number Size Drills 570-571
Appendix C: Sheet Gauges and Weights 572-577
Etc.

The appendix offers more detailed explanations, evidence or background about a topic discussed in the text. In the appendix, you will find a variety of trade information such as:

- lists of symbols,
- lists of abbreviations and trade terms,
- tables of equivalents (metric to decimal),
- torque specifications for fasteners,
- graphs, detailed calculations, and so on.

Appendices are placed at the end of the textbook for several reasons:

- ◆ so you are not distracted from the main information in a chapter,
- ◆ so you won't be slowed down by formulas when you read about a procedure or detail, and/or,
- ◆ to provide complete details on a single topic in one place or on one page.

The text will give you detailed explanations and instructions related to your trade. It will send you to the appendix to find related, useful and/or essential additional details.

Example:

Adjust your machine settings to the appropriate steel thicknesses and wire diameter using the short circuit transfer section of the MIG welding variable table. Refer to Table 1, Appendix C.

You might also read something like this:

For complete details about these standards, see Table 8 in Appendix I, page 514.

When appropriate, the text will refer you to this table again. You may also be directed to find information in this way:

See Appendix C, Table 1, for the effects of inhaling chemicals.

Use the Guides

Become familiar with a new text, flip through it. Then find out what's in it by referring to the guides that list or explain the contents. Most of us do not intend to read everything in a book to find the piece we want. We may only want two or three pieces of information. The Table of

Contents, Index and Appendix act as guides to help you retrieve information you need quickly and efficiently.

Remember

All of these guides help you with your search for information. When you need something, your progress slows down if you can't find it. These guides are tools to speed your search.

PART III ***HOW TO APPLY STRUCTURE RECOGNITION***

Know your purpose

When you set out to look for information, you know the purpose of your search and you know what you are going to do with that information. You might need any of the following:

- ◆ to understand a procedure,
- ◆ to understand a principle such as the relationship between temperature and expansion or contraction,
- ◆ to follow a safety code, and/or,
- ◆ a demonstration (pictures or diagrams) of a technique.

You can use structure recognition to help answer these types of questions:

1. Where is the information I want?
2. How do I find it without a major search?
3. What is the best guide for what I want?

Different strokes

No book, manual or guide will fit every purpose. If you know the different purposes of different texts, you save yourself time tracking down information.

Examples:

If you need an explanation about the manufacture of steel, look in a text recommended by your instructor or supervisor.

For general information about safety, look in an up-to-date textbook or handbook.

For specific safety procedures, look for provincial or association safety guides published for your trade, or look in a manufacturer's or a service manual.

The title of the text will give you a good idea if it has the information you need. But, take time to look at the Table of Contents and index to see what's in the text before you buy or borrow it. You may also decide to scan through the introduction, preface, or a few summaries.

Skip the Table of Contents

Imagine fabricating a set of gears without using a pattern. Imagine tackling any other job without a system.

Example: You have been assigned a chapter for homework. It is an unfamiliar text, but because you know what the assignment is, you don't see the point of checking the Table of Contents.

You read the assigned chapter and do the review questions at the end. You are confident of your answers except for numbers 6 and 8. The chapter doesn't give the answers. You redo the two questions and get different answers the second time through. You feel annoyed and frustrated. The next day you find someone to go through the problems with you. Your friend doesn't know the answers, but he checks your text and finds this in the Table of Contents:

Answers to Review Questions with Explanations, page 156

Always check the Table of Contents. The answers might not be listed there, but if they are, you'll save yourself some energy – and quickly get the right answers

The Structure of a Passage

In your job, every procedure follows a logical order. If work is performed out of order, the entire project will be delayed or unacceptable. Written descriptions or directions also follow a logical order. Recognizing logical structure helps you to anticipate steps, find details, and organize.

Texts, charts, guides or long passages also have a logical structure. Chapter titles and subtitles, and titles of charts and diagrams act as signals what information you will find in it. Titles, subtitles, headings and topic sentences help us to find required information quickly.

Read Passage 1 with structure and order in mind. Where or when would you expect a specific detail? Answer the questions that follow. The answers are at the end of this skills manual.

Passage 1

Backlash

Backlash is the amount of play between mating teeth. The difference between tooth space and tooth width is measured in hundredths of millimetres (thousandths of an inch). Check the appropriate table for recommended backlash. Backlash serves these purposes: it provides space for tooth expansion that results from heat; it prevents interference with incoming and outgoing teeth.

Without backlash, trapped lubrication could not escape from the tooth space as the gears rotated and could not relieve pressure. The reduction in space creates hydraulic pressure and forces the gears apart. This action causes overloading and failure of gears or support bearings. This is most evident with herringbone gear sets where the lubricant is forced into the centre and has no place to go.

Questions:

1. Where in Passage 1 would you expect to find the statement below?

Backlash allows excess lubrication to escape.

- a) In paragraph one.
- b) In paragraph two.

2. The last sentence in paragraph two states this:
"This is most evident with herringbone gear sets where the lubricant is forced into the centre and has no place to go."
3. How would you find more information about herringbone gear sets?
 - a. Look to another textbook for this information.
 - b. Continue reading until you find it.
 - c. Look in the index under **gears, herringbone**.
 - d. Refer to the appendix.

Review

Answer the following questions about Structure Recognition. **Answers are on the last page.**

Questions:

1. If you picked up a new text and wanted information on pattern drafting, which section would you check?
 - a) glossary
 - b) Table of Contents
 - c) appendix
 - d) all of the above
2. Which of the following would you expect to find in the appendix?
 - a) a list of abbreviations used on sheet metal drawings
 - b) an explanation of corrosion
 - c) the correct method to layout a pattern
3. Why is it important to understand how trade materials are organized?
 - a) This can be a model for organizing your own materials.
 - b) This can speed up your search for information.
 - c) You can assess the text for what you need.
 - d) All of the above.
4. If you take the time to assess a textbook when you get it, you may save time in the long run.

T F

CONCLUSION

Structure recognition means understanding how technical materials are organized. It also means you know how to use the standard set of guides. Understanding the structure and the guides can yield good results: You will know how to check out a textbook to get the most out of it - and how to find out if it's right for you. It will speed your search for information.

Become familiar with your books and manuals by flipping through them. You will see the individual parts and the organization behind them. The more you do this, the more comfortable you will become with your reading materials, and, the better you will be at using them to get the information you need.

Summary

1. **Understand how your trade materials are organized:** by topic from broad general information to specific, more detailed divisions.
2. **Use the system of guides provided:**
 - a. Table of Contents
 - b. Index (Indices)
 - c. Appendix (Appendices)
3. **Read the Table of Contents** to find out what is in the textbook. It's a bird's eye view of the material in this text.
4. **Find and use the glossary** (or equivalent list of trade terms) to learn new trade words.
5. **Use the index to look up a topic.** The index will give you the range of material covered and where to find it.
6. **Use the appendix for additional, related material.** Be sure that you know whether information is essential or non-essential.
7. **Apply your understanding of structure to organize your own materials.** Develop your own guide so that you can find what is important when you need it.
8. **Know where to look and know how to use a system to gain control over your studies.** You will have access to the information and the answers you need to get on with your job.

ANSWER PAGE

PART III Passage 1, Backlash

1. Where in Passage 1 would you expect to find the statement below?
Backlash allows excess lubrication to escape.

a) In paragraph one.

The sentence states a purpose of backlash. This would, logically, be inserted following the sentence in paragraph one that states, “*Backlash serves these purposes: ...*”. Paragraph two (which would follow the statement *Backlash allows excess lubrication to escape*) explains the effects if lubrication cannot escape.

2. The last sentence in paragraph two states this: “*This is most evident with herringbone gear sets where the lubricant is forced into the centre and has no place to go.*”
How would you find more information on herringbone gear sets?

c) Look in the index under gears, herringbone.

When a passage doesn't give you a specific location of further information, the index will guide you, and probably fairly quickly. You may find more if you continue reading (Answer b), provided the information is related, but it is a somewhat random and perhaps time-consuming approach.

PART III Questions

1. If you picked up a new text and wanted information on pattern drafting, which section would you check?
b) Table of Contents

Because this is a broad topic, your best bet is the Table of Contents. A textbook on precision machining should have a section or chapter(s) on patterns. The index would also guide you to specific, narrow topics on drafting such as elbows, three-piece or gore, riveted seams, two-piece ducts and so on.

2. Which of the following would you expect to find in the appendix?
a) tables for metric/imperial conversion

Usually this kind of table is in the appendix. You might find also find drill sizes, pitch and diameter combinations and so on. The appendix is used so that this kind of information is all on one page and all in the same place. Explanations (Answer b) and instructions about correct methods (Answer c) would most likely be found in one of the chapters on these topics.

3. Why is it important to understand how trade materials are organized?
d) All of the above.

When you understand how textbooks are organized it's like understanding how your shop is organized. If it begins to make sense, it makes your job easier – for all of the reasons above.

4. If you take the time to assess a textbook when you get it, you may save time in the end.
- T** When you take the time up front to understand something, you often save in the end. Understanding the whole thing means you can assess accurately, bring the right tools and equipment, and think through a drilling procedure before you plunge in. Doing the right thing may take more preparation time, but it will produce the right results and save you time once you begin the work.