EVALUATING
ACADEMIC READINESS
FOR APPRENTICESHIP TRAINING
Revised for
ACCESS TO APPRENTICESHIP

COMMUNICATIONS SKILLS
STRUCTURE RECOGNITION

AN ACADEMIC SKILLS MANUAL
for
The Metal Work Trades

This trade group includes the following trades:
Heat & Frost Insulator, Ironworker,
Precision Metal Fabricator, Sheet Metal Worker, and
Welder & Fitter

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 trade 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 Metal Work 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 the structure of printed material includes such tasks as locating information in textbooks, technical manuals, code books, and municipal regulations, using on-line-help and instruction with CAD/CAM software in the in-school programme, and locating information in math, metal theory, drafting, and welding texts quickly and effectively.

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 smaller and smaller 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

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 smaller 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 on topics grouped by trade, by level and by the steps of learning.

Large topics are separated into more specific divisions and sub-divisions.

Example:
The Blueprint
Size of Drawings
How to Handle Drawings
Student Questions

All of this information relates to a one area of study in your trade. As you read from the top down, you can see what you will cover in each section.

The Blueprint - This is the large, broad topic: it will provide an overview and general information about a type of technical drawing.
The Size of Drawings - One aspect of the broad topic: standard sizes used in the trade.
How to Handle Drawings - A second aspect of the larger topic: how to care for trade drawings.
Student Questions - This reviews the material about blueprints just covered.

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. The Table of Contents 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's 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:

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 pretty clearly 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 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 covers theory and practice designed for vocational and technical students. Each section includes guidelines for model customer service. This was added on the recommendation of instructors.

The introduction above also tells you why a section of good customer service was added. You know you are getting the benefit of feedback from people in the industry.
An introduction refers to the basic information which will be in the text. It may explain why the

information was chosen for the text, why a specific part will be important to the reader, or why some information has not been included.

> **Example:**
> This book introduces you to the fundamentals of layout, cutting, forming and fabrication of sheet metal. It is designed as a training and reference for students, apprentices and professionals. The basic principles fundamental to this trade will remain the same although the tools and technology will continue to change.

An introduction may also give you this kind of direction:

> **Example:**
> Basic techniques are explained in this chapter. Because these directions will not be repeated in each section, refer to this chapter on techniques when necessary.

The information above is clear. You will learn techniques in this chapter and then *it becomes a reference chapter*. You've 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!

The last two examples each tell 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 is 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 the 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" (Fe_2O_3) 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 (Fe_2O_3) 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 for Sheet Metal	Table of Contents entry for Sheet Metal	
Sheet Metal	**Chapter 2 Sheet Metals**	
assembly, 9	Steel Sheet Metals	17
fabrication, 12	Coated and Solid	17
galvanized, 18, 26-27, 32	Galvanized	18
hand tools, 6-10, 12-14, 15-16	Stainless steel	19
installation, 9, 10	Tin plate	19
layout, 8	Non-Ferrous Sheet Metals	20
Etc.	Aluminum	22
	Lead	23

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

Example:
Sheet metals, handling safety, 5

Although entries do not give 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:**
> Asbestos was often used for joint compound, pipe insulation, siding and floor tiles. It is dangerous if disturbed. Do not cut, sand or handle material that might contain asbestos. Refer to the Special Disposal Chart, Appendix C, for disposal guidelines. Check the municipality for specifics on disposal.

You might also read something like this:

> For complete details on 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 building codes for your city and province, look in municipal by-laws and up-to-date ministry guides published for that purpose.
>
> For general information on safety procedures, look in an up-to-date textbook or manual.

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

If you need to learn the chemical structure of metals, you will need a text or manual that is designed to teach this.

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 want to scan through the introduction, preface, or a few summaries.

Skip the Table of Contents
Imagine fabricating a box without using a pattern. Imagine tackling any other job without a system.

Example: You've been assigned a chapter for homework. It's 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
On a job site, or in the shop, work follows a logical order based on sound trade practices. 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.

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

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 metal fabricating should have a section or chapter(s) on patterns. The index would 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) a list of abbreviations used on sheet metal drawings

   Tables, charts and lists are often found in the appendix. You might find also find a chart or list with symbols used in welding and drawings. 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 long run.
   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, think through a fabrication before you plunge in. Usually doing the right thing takes more time.