Lesson Plan Reading and Using a Bill of Materials

Exploring Technologies, Grade 9 Open (TIJ10)

Adolescents are developing their strategy to read and use subject-specific texts effectively. In grades 7-12, students increasingly read complex and specialized texts. This lesson focuses on students making meaning from and extending their understanding of a bill of materials.

When students can effectively navigate complex texts, they are more equipped to use the content of the text to think, express, and reflect related to ideas and the learning about those ideas and skills.

Curriculum Expectations

Technology Fundamentals

A2. demonstrate the ability to use a variety of appropriate methods to communicate ideas and solutions

A2.1 use a variety of appropriate methods to communicate information or ideas and concepts during the planning and production stages of a project

A2.2 use correct terminology to identify and describe various processes, tools, and equipment used in creating products or delivering services

A2.4 describe and use various forms of communication to document the progress and results of the development of a product or service

Learning Goals

By the end of this lesson, students will be able to

- describe the information the bill of materials contains and how it is organized
- read a bill of materials and use the information to begin planning a project

Instructional Components and Context

Readiness

- Interpreting basic working drawings
- Using metric and imperial measuring systems
- Working together: group work norms and skills (e.g., taking roles, taking turns, disagreeing agreeably, coming to consensus)
- Using graphic organizers (e.g. T-chart, matrix) to organize information and communicate ideas
- Understanding and adhering to safety rules

Terminology

- Bill of materials
- 3-view working drawings
- Dimensions (T, W, L – thickness, width, length; order of display)
- Board feet

Materials

- Student timetables (e.g., ask students to have them available)
- A variety of sample bills of materials, some with matching working drawings
- A finished woodworking project (e.g. basic tool box)

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Minds On

Whole class > Connecting prior knowledge
Students examine their timetables as an example of a text. In a **think-pair-share**, students describe the text's structure and the possible reasons for the structure (e.g., the list represents the order of classes, each row contains a variety of information, including numbers, codes for quick reference). Debrief by inviting students to share responses.

Explain to students that text structures in Technological Education are frequently nonfiction and graphic, and reading them effectively is important to thinking and working in the subject area.

Display a simple, completed woodworking project (e.g., basic tool box). Display the working drawings for the sample project and point out that a working drawing is also considered a text. Make explicit connections between each part of the physical project with the corresponding representation on the working drawings.

Small group > Exploring purpose
Form small groups: ask students to brainstorm what would happen if the project were to be built without any sort of plans. Invite responses.

Whole Class > Previewing learning goals
Share the learning goals for this lesson. Review any **safety procedures** pertinent to this lesson.

Connections

Tip
This lesson is planned for early in a course prior to students beginning their own projects.

Strategy
Provide explicit instruction in organizational patterns, text structures and features used in the subject area.

A as L
Use the learning goals as prompts to introduce the **Action!** and to provide opportunities to reflect on learning throughout the lesson.

Action!

Small Groups/whole class > Working with subject-specific texts
Distribute a **sample bill of materials** and a **sample set of working drawings**. Groups **annotate** the bill of materials based on what they know or can figure out. (See **sample of annotated text**.)

Debrief by displaying the bill of materials, and invite students to share their annotations. Make notes on the displayed text, and sort out any misconceptions or gaps in their understanding. Make connections between the bill of materials and the working drawings (e.g., labeling is consistent). Point out that all materials required to complete a project must be recorded on a bill of materials.

Extend the discussion by posing questions: *Why is a bill of material useful? Why is it essential?* Groups brainstorm ideas to the prompts. Invite responses as a whole group.

Small group > Comparing texts
Groups compare the bill of materials and the set of working drawings to determine:

- Content contained in both texts that are the same
- Content that is the same in both texts, but displayed or presented differently
- Information that is unique to the particular text

Groups select an effective way (e.g., in a chart) to record and organize ideas. Debrief by having groups share key ideas from their comparison. Invite groups to share how they organized their information, and the reasons for selecting a method.

Connections

Tip
Expressing dimensions in the order of T-W-L is essential, as this is an industry-standard for building construction materials.

A for L
Monitor student understanding through text annotation and during whole class discussion.

Strategy
Identify the literacy demands of the subject area.

Link and Learn
Math skills required include the multiplication and division of fractions, and using Imperial measuring system.

A as L
Students' articulation of their rationale for their selection of graphic organizer.

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Consolidation	Connections
Small Groups > Applying the learning Distribute a variety of bills of materials for various projects, one to each group. Groups read over the bill of materials and determine which items are available in their shop class and which items need to be acquired. Each group reports their findings (e.g., in a mini-conference with the teacher). **Individual > Reflecting on learning** On an **exit card**, students write three to five things they will remember when working with a bill of materials.	A for L Monitor student understanding through mini-conference. **Metacognition** Engage students in reflective writing and learning conversations to expose thinking. A for L Use information from exit cards to plan next steps and/or additional support.

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Minds On

Think-pair-share

Bennett and Rolheiser (2001) describe think-pair-share as "one of the simplest of all the tactics" (page 94). As pointed out by Bennett and Rolheiser and *Think Literacy* (page 152), students require skills to participate effectively in think-pair-share, e.g.,

- active listening,
- taking turns,
- asking for clarification,
- paraphrasing,
- considering other points of view
- suspending judgment
- avoiding put-downs.

These skills can be modeled and explicitly taught. During group work, teachers can provide oral feedback and reinforce expectations.

Bennett and Rolheiser (2001) note additional considerations:

- the level of thinking required in a think-pair-share
- accountability and level of risk, e.g., are all students expected to share with the whole group? (p. 94).

See
Think Literacy Cross-Curricular Approaches, Grades 7-12, pages 152-153
Bennett, Barrie, and Rolheiser, Carol (2001). *Beyond Monet: The artful science of instructional integration.* Ajax, ON: Bookation.

Health and Safety in Technological Education

Health and safety is of paramount importance in technological education. In every course, students must be made aware that health and safety is everyone's responsibility – at home, at school, and in the workplace. Before using any piece of equipment or any tool, students must be able to demonstrate knowledge of how the equipment or tool works and of the procedures they must follow to ensure its safe use. Personal protective gear must be worn as required.

Classroom practice and all aspects of the learning environment must comply with relevant municipal, provincial, or federal health and safety legislation, including the following:

- the Ontario Workplace Safety and Insurance Act
- the Workplace Hazardous Materials Information System (WHMIS)
- the Food and Drugs Act
- the Ontario Health Protection and Promotion Act
- the Ontario Building Code
- the Occupational Health and Safety Act
- local by-laws

Teachers should make use of all available and relevant resources to make students sufficiently aware of the importance of health and safety. These resources include:

- Live Safe! Work Smart! – website and related resources
- Passport to Safety – website and related resources
- Workplace Safety and Insurance Board (WSIB)
- Industrial Accident Prevention Association (IAPA)
- Ontario Ministry of Labour (MOL)
- Canadian Centre for Occupational Health and Safety (CCOHS)
- appropriate Safe Workplace Associations (SWAs) and clinics, such as the Construction Safety Association of Ontario (CSAO), the Ontario Service Safety Alliance (OSSA), the Transportation Health and Safety Association of Ontario (THSAO), the Electrical & Utilities Safety Association

(E&USA), the Workers Health & Safety Centre (WHSC), and the Occupational Health Clinics for Ontario Workers (OHCOW).

Teachers are responsible for ensuring the safety of students during technology lab, shop, and classroom activities. Health and safety issues must also be addressed when learning involves cooperative education and other workplace experiences (see p. 39). Teachers need to encourage and motivate students to assume responsibility for their own safety and the safety of others, and they must help students develop the knowledge and skills needed for safe participation in all technology-related activities. For these reasons, teachers must model safe practices at all times and communicate safety expectations to students in accordance with school board policies and procedures, Ministry of Education policies, and Ministry of Labour regulations.

Taken from *The Ontario Curriculum: Grades 9 & 10, Technological Education,* 2009

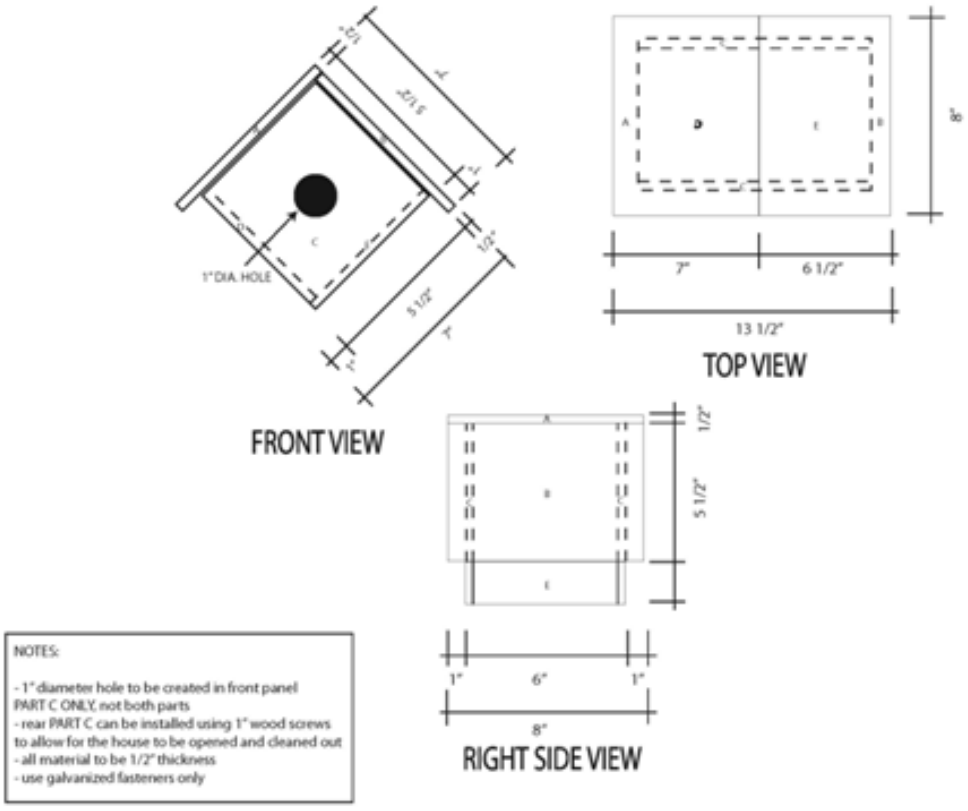
Action!

Sample Bill of Materials

PROJECT NAME: _____Wren Bird House_____

QTY.	PART NAME	NET SIZE			TYPE OF MATERIAL	STOCK SIZE			BOARD FEET	ESTIMATED COST	
		T	W	L		T	W	L	NET Total (TxWxL)/144	COST/BF	TOTAL COST
1	A – left roof panel	½"	7 1/8"	8 1/8"	Pine	½"	7"	8"	0.40	$1.70	$0.68
1	B – right roof panel	½"	6 5/8"	8 1/8"	Pine	½"	6 ½"	8"	0.37	$1.70	$0.63
2	C – front and rear walls	½"	5 5/8"	5 5/8"	Pine	½"	5 ½"	5 ½"	0.44	$1.70	$0.75
1	D – left side wall	½"	5 1/8"	6 1/8"	Pine	½"	5"	6"	0.22	$1.70	$0.37
1	E – right side wall	½"	5 5/8"	6 1/8"	Pine	½"	5 ½"	6"	0.24	$1.70	$0.41
2	F – eye hooks	3/16"	N/A	¾"	Metal	-	-	-	-	-	$1.50
4	G – back panel screws	#8	N/A	1"	Metal - Robertson	-	-	-	-	-	$0.20
										TOTAL OVERALL COST =	**$4.56**

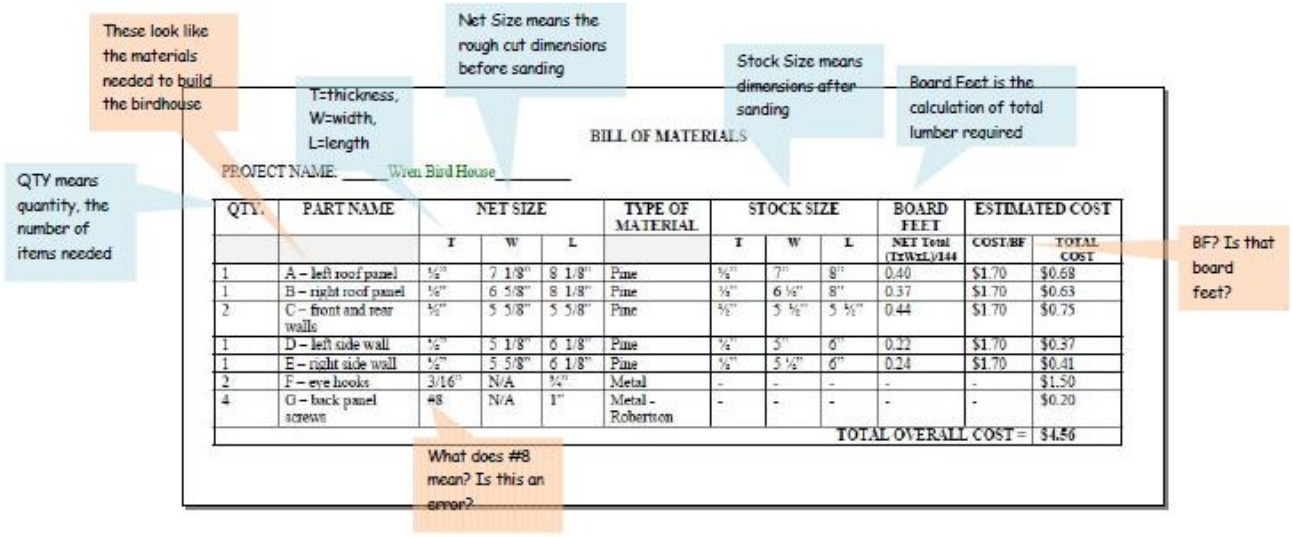
Sample Working Drawings



Annotate

Annotating is making notes on a text as it is read. Annotating is a way to document what the readers are thinking about as they work with a text. Annotations may include questions about parts of the text, identifying key ideas (e.g. by underlining) or summarizing in own words, elaborations and adding additional information (e.g., for abbreviations), identifying parts that do not make sense, and challenges about ideas in the text. If students cannot annotate directly on a text, they may use stickies as a way to capture their thinking.

Sample Annotated Text



BILL OF MATERIALS

PROJECT NAME: _____Wren Bird House_____

QTY.	PART NAME	NET SIZE			TYPE OF MATERIAL	STOCK SIZE			BOARD FEET	ESTIMATED COST	
		T	W	L		T	W	L	NET Total (TxWxL)/144	COST/BF	TOTAL COST
1	A – left roof panel	½"	7 1/8"	8 1/8"	Pine	½"	7"	8"	0.40	$1.70	$0.68
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2	C – front and rear walls	½"	5 5/8"	5 5/8"	Pine	½"	5 ½"	5 ½"	0.44	$1.70	$0.75
1	D – left side wall	½"	5 1/8"	6 1/8"	Pine	½"	5"	6"	0.22	$1.70	$0.37
1	E – right side wall	½"	5 5/8"	6 1/8"	Pine	½"	5 ½"	6"	0.24	$1.70	$0.41
2	F – eye hooks	3/16"	N/A	¾"	Metal	-	-	-	-	-	$1.50
4	G – back panel screws	#8	N/A	1"	Metal - Robertson	-	-	-	-	-	$0.20
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Consolidation

Exit Card

Exit cards prompt students to write responses which allow reflection on learning, for example, during the consolidation of a lesson. The exit card response may be used to provide assessment information.