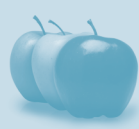


Differentiated Instruction Teaching/Learning Examples



GRADE 10 CONSTRUCTION TECHNOLOGY (TCJ20): WALL DESIGN—TECHNOLOGICAL EDUCATION

Five 75-minute periods

1. Numbered Heads—Ranking (Cooperative Learning)*
2. Think-Pair-Square—Wall Concepts Review (Questions, Cues and Advance Organizers)*
3. Classifying—Design Process Cards (Identifying Similarities and Differences)*
4. Self-assessment Exit Card
5. Wall Design RAFT (Role, Audience, Format, Topic)** Assignment
6. RAFT Peer Presentations (Setting Objectives and Providing Feedback)*

*Marzano's Categories of Instructional Strategies (See Resources, below.)

**Differentiated Instruction Structure

DIFFERENTIATED INSTRUCTION DETAILS

Knowledge of Students

Differentiation based on student:

- Readiness Interests Preferences: Styles Intelligences Other (e.g., environment, gender, culture)



Need to Know

- Students' prior knowledge of wall design and construction, prior experience with creating materials lists and preferences for various drawing and presentation formats to design choices for the Wall Design RAFT Assignment (Appendix E)

How to Find Out

- Observation of students during wall terminology and materials estimates activity (Appendix A) and student self-assessment (Appendix D)

Differentiated Instruction Response

- Topic, Entry Point (content) Ways of learning (process) Ways of demonstrating learning (product) Learning environment

CURRICULUM CONNECTIONS

Overall Expectation: A. Construction Technology Fundamentals

A3. Use correct terminology to describe building components and construction materials, tools, equipment and processes

Overall Expectations: B. Design Layout and Planning Skills

B1. Design construction projects, individually or in small groups, applying a design process to plan and develop the projects and other problem-solving processes to address various related problems and challenges

B2. Use drawings to represent design ideas and solutions to technological challenges, and interpret drawings accurately when working on construction projects

B3. Apply the mathematical skills required in the planning and building of construction projects

Specific Expectation: (A3) Terminology

A.3.2 Use correct terminology to describe building components and construction processes

Specific Expectations: (B1) Design and Problem Solving; (B2) Technical Drawings; (B3) Mathematical Skills

B1.1 Follow the steps of a design process to plan and develop a construction project

B1.3 Apply appropriate technological concepts as they work through design and or problem-solving processes

B2.1 Produce sketches, technical drawings, and detail drawings to represent design ideas and solutions for a variety of construction projects

B3.5 Prepare estimates, using appropriate metric and/or imperial units of the materials required to complete construction projects and estimate the cost of these materials

Learning Goals:

- Follow the steps of the design process to produce a scaled drawing for an exterior wall section (e.g., shed, garage)
- Apply construction knowledge to the wall design (e.g., load bearing, non-load bearing)
- Use the imperial system (e.g., considers nominal vs. actual number size) for designing exterior walls
- Create a materials list for the exterior wall
- Use correct terminology to explain the exterior wall plans and materials

ASSESSMENT AND EVALUATION

Assessment/Success Criteria

Knowledge and Understanding

- Uses construction terminology in the presentation

Thinking

- Follows the design process to produce a scaled drawing of a wall within the given parameters

Application

- Uses the imperial system to produce the scaled drawing
- Creates a materials list for the exterior wall
- Applies technological construction concepts to the drawing

Assessment Tools:

- Anecdotal Comments
- Checklist
- Rubric
- Rating Scale

PRIOR LEARNING

Prior to this lesson, students will have:

- Some knowledge of the terminology for components of exterior walls
- Experience using the imperial system for designs
- An understanding of concepts and some experience related to wall design (e.g., thickness, foundation, wall layout)
- Experience producing scale drawings using software or mechanical pencil
- Experience making materials lists

MATERIALS AND RESOURCES

Materials:

Sample drawings, photos and other images of walls for the initial Minds On activity (see Numbered Heads—Ranking section)

Chart paper, file folders, coloured paper (four to five colours)

Computer with Internet access for research, design process software (e.g., CAD) and presentation software

Appendix A: Wall Components—one per student

Appendix B: Steps in the Design Process Cards (see instructions at top of Appendix B)

Appendix C: Steps in the Design Process—Wall Design (Teacher Reference)

Appendix D: Wall Design Self-assessment Exit Card—one per student

Appendix E: Wall Design RAFT Assignment—one per student

Appendix F: Design Process Log—one per student

Appendix G: Wall Design Checklist—one per student

Appendix H: Wall Design Rubric—one per student

Resources:

Kagan, Spencer (1994). *Cooperative Learning*. San Clemente, CA: Kagan Publishing. (Numbered Heads)

Marzano, Robert J., Pickering, Debra and Pollock, Jane E. (2001). *Classroom Instruction that Works: Research-Based Strategies for Increasing Student Achievement*.

Alexandria, VA: ASCD.

Ministry of Education (2009). *The Ontario Curriculum, Grades 9 and 10, Technological Education*. (Design Process, pp. 18–19)

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Teaching/Learning Sequence: Grade 10 Construction Technology (TCJ20): Wall Design—Technological Education

<p>MINDS ON</p> <ul style="list-style-type: none"> Establishing a positive learning environment Connecting to prior learning and/or experiences Setting the context for learning 	<p>CONNECTIONS</p> <p>L: Literacy ML: Mathematical Literacy AfL, AoL: Assessment for/of Learning</p>
<p>Create a context for learning by explaining that students, in the role of a lead contractor, will be designing a scaled drawing of an exterior wall and making a materials list for the wall. They will then explain the design and the materials list to a prospective builder. Based on the prior experience of students, decide whether students should complete the assignment individually, in pairs, or in small groups and decide what drawing format options may be used (e.g., CAD software, pencil).</p> <p>Groups of Four → Numbered Heads—Ranking To draw attention to the complexities (e.g., number of openings) of wall design, provide students in small groups with a selection of photos, drawings, and/or sketches of various walls. Encourage students to bring their own samples as well. Explain that students will be called upon by number to answer questions about their group decisions, so everyone in the group must be ready to respond. Students: <ul style="list-style-type: none"> Form small groups and number off 1 through 4 in each group Take turns speaking as they discuss each sample in terms of design considerations such as scale, number of openings, size of openings Rank each wall from simplest to most complex and provide a reason for the ranking Ensure that all students in their group can respond if called upon to explain the rankings Consolidate the activity with a whole class discussion, noting the depth of understanding students demonstrate in their response. Indicate that students will be able to choose the level of complexity for their wall design.</p> <p>Pairs/Groups of Four → Think-Pair-Square—Exterior Wall Concepts Review Explain that in order to design the wall, make a materials list and communicate to the audience, students will need to use appropriate terminology. Distribute Wall Components (Appendix A). Students: <ul style="list-style-type: none"> Individually label the components of a wall, work with the scale provided to determine the actual dimensions and create a materials list for the wall Share and compare answers with a partner Share and compare with another pair and note anything that caused confusion Check that students understand the terminology and note terms on chart paper for student reference (i.e., Word Wall). Debrief scale, dimensions and materials list clarifying and focusing on key factors involved in the process (e.g., accurate calculations, scale). Clarify the criteria for a materials list (e.g., accurate and complete). Review the required construction knowledge (e.g., thickness, spacing of studs, load bearing requirements). Address any misconceptions and provide additional support as required.</p> <p>Groups of Seven → Classifying—Design Process Cards Ask students to list all the things that a lead contractor would have to do before she/he could present a wall design to an audience. Record the list of ideas generated by the class (i.e., Lead Contractor “to do” list) and explain that the steps on the list can be organized using the design process. Copy three or four sets (depending on the size of the class) of the Steps in the Design Process Cards (Appendix B) each in a different colour. There is a card for each phase of the design process. Cut up the cards and hand a Design Process Card to each student. Students: <ul style="list-style-type: none"> Find other classmates with cards of the same colour to form groups of seven Arrange themselves in order from the start of the creative process to the end without talking Share with the class the order they have come up with for the design process Make connections between the steps in the design process and the items on a lead contractor “to do” list Discuss any discrepancies until the class has a common understanding of the steps in the design process. Refer to the Steps in the Design Process—Wall Design (Teacher Reference) (Appendix C) for examples of connections between this assignment and the design process.</p> <p>Review the learning goals with the students and indicate that students will have an opportunity to apply the skills and concepts that have been reviewed in the Wall Design RAFT Assignment (Appendix E).</p> <p>Individuals → Self-assessment Exit Card In preparation for the RAFT Assignment, students complete the Wall Design Self-assessment Exit Card (Appendix D) to help them make appropriate choices. Use student responses from the Exit Cards to inform the design of the RAFT and the amount of support students require.</p>	<p>AfL: Numbered Heads/ Anecdotal Comments</p> <p>L: Subject-specific literacy/ Labelling ML: Using mathematical processes/Wall Components</p> <p>AfL: Think-Pair-Square/ Anecdotal Comments</p> <p>AfL: Self-assessment/Rating scale</p>
<p>ACTION</p> <ul style="list-style-type: none"> Introducing new learning or extending/reinforcing prior learning Providing opportunities for practice and application of learning (guided → independent) 	
<p>Whole Class → Wall Design RAFT Assignment Students complete the Wall Design RAFT Assignment (Appendix E) in which they, as lead contractors, design and explain a scaled drawing of an exterior wall and make a materials list for a prospective builder. The Wall Design RAFT Assignment (Appendix E) provides students with a choice of audience, ways of producing the sketch, ways of presenting to the selected audience, and levels of complexity (e.g., number of wall openings).</p> <p>Distribute and review with students the Wall Design RAFT Assignment (Appendix E) and the Design Process Log (Appendix F). Explain that the students will be logging their activities for each step of the design process. Stress that the process is not linear and that they will often go back to an earlier step in the log to add more details. Discuss the consequences of not being thorough and or accurate at each step (e.g., safety, clarity, financial cost). Distribute file folders and encourage students to set up a “client folder” for all sketches, drawings and material estimates.</p> <p>Distribute and review the assessment criteria in the Wall Design Checklist (Appendix G) and Wall Design Rubric (Appendix H). Refine both the checklist and rubric based on student input.</p> <p>Based on the prior experience of the students, the information gleaned from their self-assessments, and ongoing conferences throughout the lesson sequence, set up short demonstrations or workshops as required (e.g. determining scale, inserting windows, calculating materials) to meet their needs.</p>	<div data-bbox="1225 1982 1463 2076" style="float: right; text-align: center;">  <p>DI READINESS, INTERESTS, PREFERENCES— STYLES</p> </div> <p>AfL: RAFT/Anecdotal Comments</p>
<p>CONSOLIDATION AND CONNECTION</p> <ul style="list-style-type: none"> Helping students demonstrate what they have learned Providing opportunities for consolidation and reflection 	
<p>Small Groups → RAFT Peer Presentations Students: <ul style="list-style-type: none"> Present their wall plans and estimates in small groups of peers using the communication method of their choice Use the Wall Design Checklist (Appendix G) to peer-assess each other’s plans and make suggestions for improvement Adjust drawings and materials lists as appropriate based on feedback Observe and listen to the discussions of students. Collect and assess the Wall Design RAFT Assignments (Appendix E) using the Wall Design Rubric (Appendix H). Evaluate if students have had sufficient practice and feedback and if the RAFT Assignment has been completed individually.</p>	<p>AfL: Peer assessment/Checklist</p> <p>AoL: RAFT/Rubric</p>