

Model Lesson

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| Unit Name: What's In The Dimensions? | | Unit Length: 1 Week | |
| Overview: This Middle School lesson provides opportunities for students to increase their conceptual understanding of one-two- and three-dimensional objects through the use of manipulatives and worksheets. | | | |
| DESIRED RESULTS | | | |
| TEKS and Student Expectations (See Appendix A for detailed description.) (6.8) Measurement. (B) | | | |
| (7.8) Geometry and spatial reasoning. (B) | | | |
| (8.7) Geometry and spatial reasoning. (A) | | | |
| <u>Enduring Understandings (Big Ideas)</u> Points, lines, and planes are the foundations of geometry. | <u>Essential Questions</u> Why are <i>point</i> , <i>line</i> , and <i>plane</i> the undefined terms of geometry? How are properties of geometric figures related to their measurable attributes? What are the similarities and differences of plane and solid geometric figures? What is the difference between a plane and a solid? How are formulas used to find perimeter, area, volume and surface area of geometric solids? What is the difference between a plane and a solid? | <u>Critical Vocabulary</u> Dimensions of a geometric figure Point, line, & plane One-dimensional figure Two-dimensional figure Three-dimensional figure Spatial reasoning Surface area Length Width Height Area Base Face Edge Volume Net Vertex/Vertices Geometric | |

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| <p><u>Learning Goals</u> To help develop conceptual understanding of dimensions for one-, two-, and three-dimensional figures</p> | | <p><u>Materials Needed</u> A straight edge (customary units) Square inch tiles Cubes (1 cubic inch) Graph paper (1 square inch) Worksheet 1</p> |
| ASSESSMENT PLAN | | |
| <p><u>Performance Tasks</u> Based on an in-class assignment and a teacher-prepared rubric (See Attachment), students will:</p> <ul style="list-style-type: none"> • demonstrate the use of appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, and volume • make a net (two-dimensional model) of the surface area of a three-dimensional figure • draw three-dimensional figures from different perspectives | | <p><u>Other Evidence</u> Formative assessment will be made by class discussions and group and/or individual class work</p> |
| GENERAL MELL CONNECTIONS THAT APPLY TO ALL LESSONS | | |
| <p>(MC-01) - To assist the ELLs, the teacher should avoid speaking too rapidly and when possible use basic words rather than unfamiliar ones to introduce new concepts.</p> <p>(MC-02) - Teachers should foster trusting relationships with ELLs through informal conversations and presentation of a culturally rich classroom.</p> <p>(MC-03) - ELLs may need extra opportunities to demonstrate mastery. Grading policies should be flexible enough to provide multiple learning opportunities without severe grade penalties.</p> <p>(MC-04) - ELLs may work at a slower pace than other students because of limited English language skills and should be provided with shortened assignments, or when appropriate, extra time to work on assignments.</p> <p>(MC-05) - ELLs should be scheduled in a math class that has students who have some proficiency in both languages. Teachers may need to work with counselors and others to ensure that this happens.</p> <p>(MC-06) - Teachers should offer tutoring as frequently as</p> | | |

possible and encourage ELLs to come in for extra assistance. If possible, the teacher should arrange for an aide or parent volunteer who speaks the language of the ELL to help with translation during the tutoring period on a regular schedule (for example, on Tuesdays and Thursdays, after school).

LEARNING PLAN

The teacher should guide the students through the following activities by introducing concepts with visual aids, modeling, sample problems, guided discussion and questioning:

EXPLORATORY QUESTIONS (Examples):
What is the area of a figure with dimensions 2 inches by 2 inches?

What is the volume of a figure with dimensions 2 inches by 2 inches by 2 inches?

1. Provide students with worksheet 1.
2. Students use a straight edge to illustrate a one-dimensional figure measuring 2 inches (line). Also, label the figure: $l = 2$ in and fill-in the first section of worksheet 1, one-dimensional. (MC-08), (MC-09), (MC-10), (MC-16)
3. Students use the square inch tiles to illustrate a two-dimensional figure with measurements 2 inches by 2 inches. Use this information to fill-in the rectangular gray area of worksheet 1 under two-dimensional. (MC-08), (MC-09), (MC-10)), (MC-16)
4. Students proceed to cut a 2 in. by 2 in., square to represent a two-dimensional figure. Students label the figure: length = 2 in., width = 2 in., and area = 4 sq. in. Paste the square on worksheet under two-dimensional. (MC-08), (MC-09), (MC-10)), (MC-16)

MELL Connections

(MC-08) - Hands-on activities involving math manipulatives are typically helpful to ELLs because the lesson involves multiple learning modalities and does not require the student to rely solely upon his/her ability to understand verbal instruction.

(MC-09) - To assist the ELLs, the teacher should model the expected task and use visual representations to reinforce concepts and/or steps in the problem-

5. Students use the cubic inches blocks to illustrate a three-dimensional figure with measurements 2 inches by 2 inches by 2 inches. Use this information to fill-in the rectangular gray area of worksheet 1 under three-dimensional. (MC-08), (MC-09), (MC-10)), (MC-16)

6. Students cut a net out of the graphing paper to illustrate a 2 by 2 by 2, cube. The dimensions of the cube are labeled: length = 2 in., width = 2 in., area of base = 4 sq. in., height of 2 in. (MC-08), (MC-09), (MC-10)), (MC-16)

7. One of the bases of the net is to be glued down on section 3 on worksheet 1. Edges are to be fold in such a manner to illustrate a cube. Do not tape or glue down any of the edges. This will allow student to use it to find the volume of the cube and to fold flat for storing away. (MC-08), (MC-09), (MC-10)), (MC-16)

8. Post vocabulary words that are to be used with the activity (e.g., length, width, height, area, volume, base, face, edge, vertex/vertices, net, etc.). (MC-08), (MC-09), (MC-10)), (MC-16)

DISCUSSION: What are the various methods of representing units? (MC-08)

REFLECTION: What did you discover about patterns among the dimensions by graphing the measurements for each of the dimensions?

PROBLEMS FOR PRACTICE:

Find the area of the base then include the height to find the volume for a figure: 3 x 3 x 3 and 4 x 4 x 4.

EXTENSIONS TO ADVANCED MATH: Graph the measurements of each the dimensions helps students to find patterns. Extend the lesson by analyzing the type of graphs produced when comparing one dimension and

solving process. Critical concepts should be clearly emphasized and repeated.

(MC-10) - ELLs should be provided with or assisted in developing a learning aid that shows math vocabulary in both English and their native language and should be allowed to use this tool when working on assignments. Student-made glossaries, word walls, and compare and contrast charts may help ELLs learn mathematics vocabulary.

(MC-16) - When monitoring ELLs during instruction, the teacher should make a special effort to to assist, re-explain and demonstrate again, if necessary. Encouragement and reinforcement should be used frequently.

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its effect on length, area, and volume.

CLOSURE: Reinforce the concept that illustrating dimensions in various forms helps to visualize relationships.

English Language Proficiency Standards Quick Reference. (Chapter 74. Curriculum Requirements Subchapter A. Required Curriculum, §74.4. English Language Proficiency Standards). The standards checked here are merely examples for the teacher's consideration for inclusion in this lesson.

Cross-curricular second language acquisition/ listening. The ELL listens to a variety of speakers including teachers, peers, and electronic media to gain an increasing level of comprehension of newly acquired language in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in listening. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated

- [X] (c)(2)(A) - distinguish sounds and intonation patterns of English with increasing ease;
- [X] (c)(2)(B) - recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters;
- [X] (c)(2)(C) - learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions;
- [X] (c)(2)(D) - monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed;
- (c)(2)(E) - use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language;
- (c)(2)(F) - listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment;
- [X] (c)(2)(G) - understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar;
- (c)(2)(H) - understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations; and
- (c)(2)(I) - demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages,

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| <p>(communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:</p> | <p>responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs.</p> |
| <p>Cross-curricular second language acquisition/speaking. The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated</p> | <p>[X] (c)(3)(A) - practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible;</p> <p>[X] (c)(3)(B) - expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication;</p> <p>(c)(3)(C) - speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired;</p> <p>[X] (c)(3)(D) - speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency;</p> <p>[X] (c)(3)(E) - share information in cooperative learning interactions;</p> <p>(c)(3)(F) - ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments;</p> <p>(c)(3)(G) - express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-</p> |

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| <p>(communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:</p> | <p>appropriate academic topics; (c)(3)(H) - narrate, describe, and explain with increasing specificity and detail as more English is acquired; (c)(3)(I) - adapt spoken language appropriately for formal and informal purposes; and (c)(3)(J) - respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment.</p> |
| <p><i>Cross-curricular second language acquisition/reading.</i> The ELL reads a variety of texts for a variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English</p> | <p>(c)(4)(A) - learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words; (c)(4)(B) - recognize directionality of English reading such as left to right and top to bottom; [X] (c)(4)(C) - develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials; (c)(4)(D) - use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text; [X] (c)(4)(E) - read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned; [X] (c)(4)(F) - use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language; [X] (c)(4)(G) - demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material,</p> |

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| <p>language proficiency. For Kindergarten and Grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text. The student is expected to:</p> | <p>responding to questions, and taking notes commensurate with content area and grade level needs; (c)(4)(H) - read silently with increasing ease and comprehension for longer periods; (c)(4)(I) - demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs; (c)(4)(J) - demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs; and (c)(4)(K) - demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs.</p> |
| <p><i>Cross-curricular second language acquisition/writing.</i> The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order</p> | <p>(c)(5)(A) - learn relationships between sounds and letters of the English language to represent sounds when writing in English; (c)(5)(B) - write using newly acquired basic vocabulary and content-based grade-level vocabulary; (c)(5)(C) - spell familiar English words with increasing accuracy, and employ English spelling patterns and rules with increasing accuracy as more English is acquired; (c)(5)(D) - edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired; e(c)(5)(E) - employ increasingly complex grammatical structures in content area writing commensurate with grade-level expectations, such as:</p> |

for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

- (i) using correct verbs, tenses, and pronouns/antecedents;
 - (ii) using possessive case (apostrophes) correctly; and
 - (iii) using negatives and contractions correctly;
- (c)(5)(F) - write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired; and
- (c)(5)(G) - narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.

Appendix 1TEKS and Student Expectations

(6.8) **Measurement.** The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles.

The student is expected to (B) select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, and volume

(7.8) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world.

The student is expected to (B) make a net (two-dimensional model) of the surface area of a three-dimensional figure

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world.

The student is expected to (A) draw three-dimensional figures from different perspectives

Formative Assessment Rubric

Part a) Correct Solution: Yes No

| Criteria | 4 | 3 | 2 | 1 |
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| Part b) Conceptual Knowledge | <p>Attribute(s) of concept(s) Correctly identifies attributes of the problem, which leads to correct inferences</p> <p>Inferences Combines the critical attributes of the problem in order to describe correctly the mathematical relationship(s) inherent in the problem</p> | <p>Attribute(s) of concept(s) Correctly identifies attributes of the problem, which leads to correct inferences.</p> <p>Inferences Combines the critical attributes of the problem in order to describe correctly the mathematical relationship(s) inherent in the problem</p> | <p>Attribute(s) of concept(s) Identifies some of the attributes of the problem, which leads to partially correct inferences</p> <p>Inferences Combines the identified attributes of the problem which leads to a partial identification of the mathematical relationship(s) inherent in the problem</p> | <p>Attribute(s) of concept(s) Lacks identification of any of the critical attributes of the problem.</p> <p>Inferences Combines few of the attributes of the problem which leads to an incomplete identification of the mathematical relationship(s) inherent in the problem</p> |
| Part c) Procedural Knowledge | <p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses appropriate representation to connect the procedure to the concept of the problem.</p> <p>Algorithmic competency Correctly implements procedure to arrive at a correct solution.</p> | <p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses appropriate representation to connect the procedure to the concept of the problem.</p> <p>Algorithmic competency Implements selected procedure but arrives at an incorrect solution.</p> | <p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses inconsistent or insufficient representation for the selected solution strategy.</p> <p>Algorithmic competency Implements selected procedure but arrives at an incorrect or correct solution. (See Part a above)</p> | <p>Appropriate strategy Selects and implements an inappropriate strategy.</p> <p>Representational form Uses incorrect representations.</p> <p>Algorithmic competency Makes significant errors.</p> |
| Part d) Communication | <p>Justification Fully answers the question of "why" for the strategy selection, explains procedure, and/or evaluates reasonableness of solution.</p> <p>Terminology Uses appropriate terminology and notation.</p> | <p>Justification Fully answers the question of "why" for the strategy selection, explains procedure, and/or evaluates reasonableness of solution.</p> <p>Terminology Uses some appropriate terminology or notation.</p> | <p>Justification Incompletely answers the question of "why" for the strategy selection; explains procedure; and/or evaluates reasonableness of solution.</p> <p>Terminology Uses some appropriate terminology or notation.</p> | <p>Justification Provides very little or no explanation of what was done and why.</p> <p>Terminology Uses limited or inappropriate terminology or notation.</p> |