Dual Language Education of New Mexico

STUDENT SCAFFOLDING AIM4S³ SUCCESS ™

Achievement Inspired Mathematics for Scaffolding Student Success

Empowering Language Learners to Speak: Strategies that Make a Difference

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REFERENCES

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- Mayer, E. & Meyer, L. (2014). *Achievement inspired mathematics for scaffolding student success: An instructional framework for language and content learning.* Albuquerque, NM: Fuente Press.
- National Research Council. (2001). *Adding it up: Helping children learn mathematics.* J. Kilpatrick, J. Swafford, & B. Findell (Eds.). National Academies Press.
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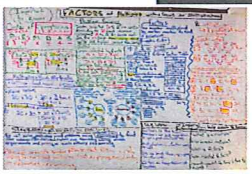
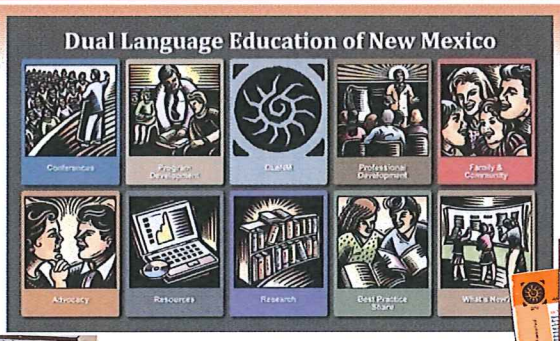
ON-LINE RESOURCES TO SUPPORT TEACHERS

Classroom Videos

Chant Bank



Compendium Bank



AIM4S[3] Future Training Information

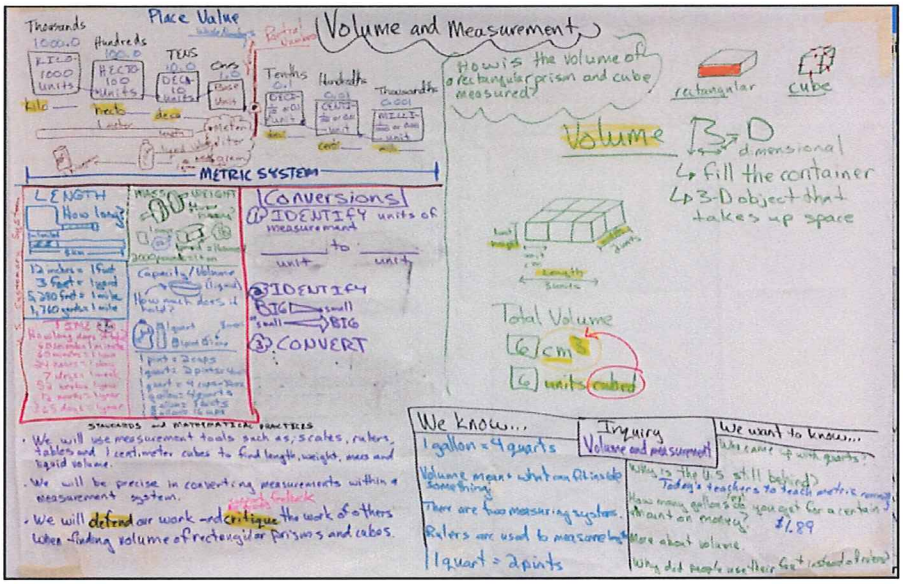
www.dlenm.org

Publications

Empowering Language Learners to Speak: A Glimpse into Our Unit on Volume

Conceptual Understanding

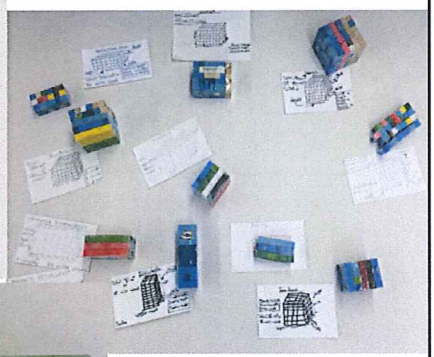
- Concrete examples
- Visual representation
- Physical manipulatives
- Real-world connection

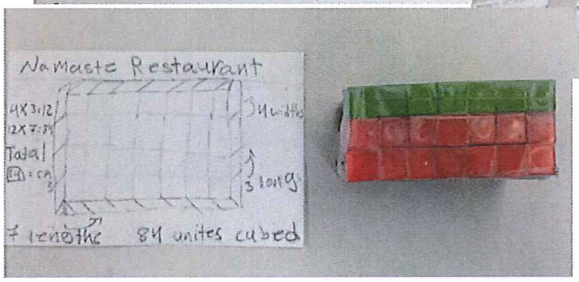


MINECRAFT TASK

IN ORDER TO PLACE YOUR MINECRAFT BUILDING INTO OUR 5TH GRADE MINECRAFT VILLAGE, YOU MUST COMPLETE THE FOLLOWING:

1. **CONSTRUCT A BUILDING USING "UNIT CUBE" BLOCKS. YOUR BUILDING MUST HAVE MORE THAN ONE LEVEL.**
2. **ON AN INDEX CARD (3X5)**
   - **A. SKETCH YOUR BUILDING**
   - **B. LABEL ALL 3 DIMENSIONS**
   - **C. WRITE THE UNITS FOR EACH DIMENSION (HEIGHT, LENGTH, WIDTH)**
   - **D. PROVIDE A TITLE OF YOUR BUILDING NAME**
   - **E. STATE THE TOTAL UNITS CUBED AND TOTAL CENTIMETERS (CM) CUBED**





Empowering Language Learners to Speak: A Glimpse into Our Unit on Volume

Planned Peer Interaction

- Small group work
- Partner work
- Teacher to student, student to student feedback
- Sentence frames to support student discussion and report out

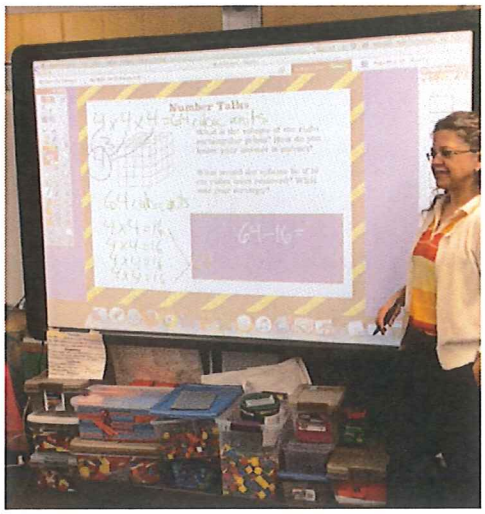
Oral and written sentence frames

I think the answer is _____ because...
I disagree with _____ because ...
I agree with _____ but want to add...

Empowering Language Learners to Speak: A Glimpse into Our Unit on Volume

Deepening Understanding

- Number Talks
- Formative assessment tasks
- Respond to arguments
- Critique self and others
- Sentence frames to support discussion and report out
- Teacher to student, student to student feedback



Lesson Sequence

1) Work with your team to complete the task.

2) Critique your team's work on the task and score your work on the rubric.

3) Exchange your team's work with another team. Critique their work and score their work on the rubric.

4) Be prepared to explain your critique for your team's scores and the critique for the other team's scores.

Discussion Starters

Agreeing
Our solution is similar to _____ solution. We think _____.
We agree with _____ solution and want to add _____.

Disagreeing
We don't agree with _____ solution because_____.
We have a different solution from _____. We think _____.

Clarifying
We need _____ team to explain _____.
What did _____ team mean by _____.

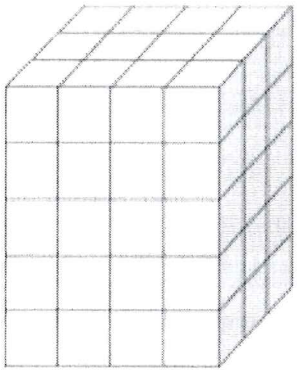
Critique
_____ team earned proficient because _____.
_____ team earned nearing proficient because _____.
_____ team earned beginning steps because _____.

See handout: Rectangular Prism Task and Team Scoring Rubric

Rectangular Prism Task

You will be working with your team to complete the following task. Upon completion of this task, your team will critique your work using the rubric and then will critique the work of another team using the rubric. Be prepared to construct an argument for the scores given. Prepare your final product on another piece of paper with the following:

In this right rectangular prism, each small cube measures 1 unit on each side.



1. What is the volume of the prism?

2. Explain how you found the volume. Show your work in your explanation.

3. What would be the dimensions of a new right rectangular prism that has 20 fewer unit cubes than the original prism?

4. Explain how you determined the dimensions of the new right rectangular prism. Enter your answers and your explanations in the space provided

You will need to decide how to present your information to the class. It must be clearly labeled and organized so that your product provides all the information without you having to explain it.

Team Scoring Rubric

Proficient

_____ We/they **DETERMINED** the volume of the prism.

_____ We/they **EXPLAINED** how we/they found the volume and **DEMONSTRATED** our/their work in our/their explanation.

_____ We/they **DETERMINED** the volume of the prism that has 20 fewer units than the original prism.

_____ We/they **EXPLAINED** how we/they found the dimensions of the new right rectangular prism.

_____ Our/their work is **LABELED** clearly and is **ORGANIZED** so that our/their product provides all the information without needing someone from our team to explain it.

Nearing Proficient

_____ We/they **DETERMINDED** the volume of the prism.

_____ We/they mostly **EXPLAINED** how we/they found the volume and **DEMONSTRATED** some of our/their work in our/their explanation.

_____ We/they **DETERMINDED** the volume of the prism that has 20 fewer units than the original prism.

_____ We/they mostly **EXPLAINED** how we/they found the dimensions of the new right rectangular prism.

_____ Our/their work is mostly **LABELED** clearly and is somewhat **ORGANIZED** so that our/their product doesn't provide all the information without needing someone from our team to explain it.

Beginning Steps

_____ We/they didn't **DETERMINE** the volume of the prism.

_____ We/they didn't **EXPLAIN** how we/they found the volume and didn't **DEMONSTRATE** our/their work in our/their explanation.

_____ We/they didn't **DETERMINE** the volume of the prism that has 20 fewer units than the original prism.

_____ We/they didn't **EXPLAIN** how we/they found the dimensions of the new right rectangular prism.

_____ Our/their work is not **LABELED** clearly and is not **ORGANIZED** so that our/their product provides all the information without needing someone from our team to explain it.

AIM4S^{3}™—Framework Overview

Achievement Inspired Mathematics for Scaffolding Student Success, AIM4S^{3}™, is designed to provide a framework of instructional components that shelter and scaffold mathematics content to make it comprehensible and accessible to all students, with a specific focus on English learners (ELs) and academic language learners (ALLs). AIM4S^{3}™ can be implemented with any mathematics program or curriculum for students in kindergarten through high school, as well as post-secondary school.

The following is an overview of the components of the framework and the Key Instructional Principles that lead to higher student achievement. The framework components provide strategies to support student learning. The opening and closing components frame the core lessons to support students in building a strong understanding of the mathematical concepts. The Key Instructional Principles provide the pedagogical foundation on which the framework is based. These principles guide all instruction.

Framework Components

Below is a diagram of the different components of the framework, including:

Opening:

- Two introductory components that are implemented at the beginning of a unit:
  - Focus/Motivation
  - Compendium

Unit Instruction:

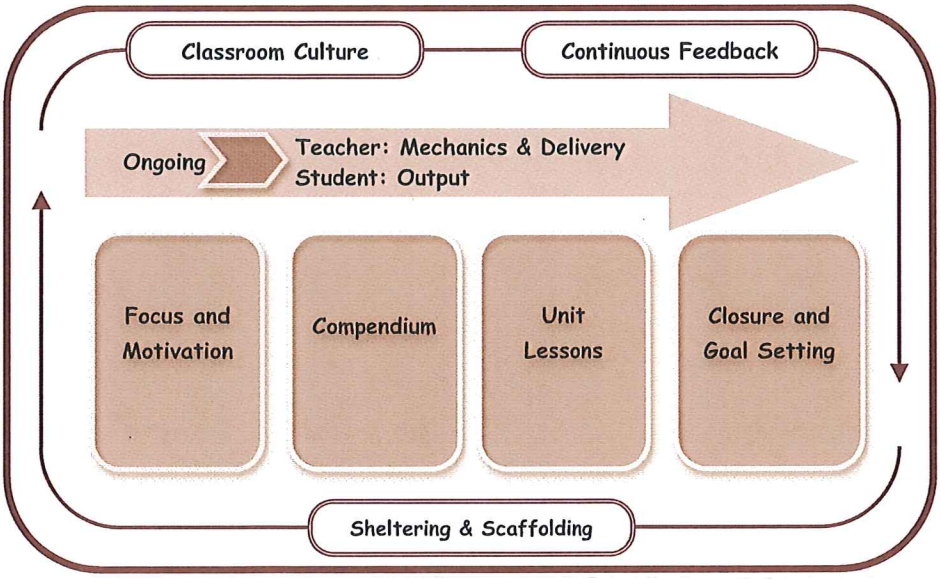
- Mathematics unit lessons

Closing:

- Two ending components after the unit assessment
  - Closure
  - Goal Setting

Key Instructional Principles

- Teacher Mechanics and Delivery
- Student Output
- Positive Classroom Culture
- Sheltering and Scaffolding
- Continuous Feedback



For more information about AIM4S^{3}, visit www.AIM4Scubed.dlenm.org or email lisa@dlenm.org.

Key Instructional Principles

Five Key Instructional Principles provide the pedagogical foundation for the framework: Teacher Mechanics and Delivery, Student Output, Positive Classroom Culture, Continuous Feedback, and Sheltered and Scaffolded Instruction. A positive classroom culture, built on mutual respect, that supports risk taking and student ownership of their learning surrounds all other elements of instruction. Strong sheltering and scaffolding practices are used to ensure all students have access to the content and language of instruction, and these supports are removed as students no longer need them. Teacher mechanics and delivery acknowledges the importance of careful planning and a deep knowledge of the curriculum and effective instructional strategies on the part of the teacher. Student output highlights the critical need for students to have multiple and varied opportunities to process information orally with peers, as well as in writing, to develop language skills, higher-order thinking skills, and content knowledge. Students must be active, vocal learners in the classroom. Lastly, continuous feedback is a timely, ongoing process which provides students with accurate and relevant feedback on their progress and informs teachers as to the effectiveness of their instruction. Exit slips, homework, collaborative tasks, and formal assessments as well as honest discussion and feedback during action planning and classroom meetings are all opportunities to inform instruction and improve student outcomes.

Sixth grade students work collaboratively on their graphing skills.

The Key Instructional Principles are referred to throughout this monograph to give the reader a sense of how they are interwoven throughout the components. They are the glue that holds all of the pieces together.

Framework Components

Opening

The first component of the opening, Focus and Motivation, is meant to prime students' thinking prior to teaching new concepts and to create connections between students' current understandings and these new concepts. Developing schema, or prior knowledge or understandings, is essential for learners to make connections between ideas and concepts (Andersen, 1984). When beginning a new unit, the teacher utilizes strategies that generate excitement and provide experiences for students that they can build on throughout the unit. They also provide informal formative assessment information that helps guide instruction later during the unit lessons. These introductory components are designed to create an interest in and a foundation for the unit of study ahead. They include literature connections, exploration activities, technology resources, games, songs and chants, and real-world applications.

The second component, the Compendium, is a large resource chart created with the students that provides the foundational "big picture" for the unit. The Compendium consists of three parts: the concept frame, student-friendly standards and mathematical practices, and the inquiry chart. The concept frame visually represents the key concepts in the unit and includes essential vocabulary and descriptors. The standards with the mathematical practices embedded provide clear expectations for the students, and the inquiry chart captures what students already know about the topic along with questions that they have.

The Compendium is a living chart; throughout the unit, vocabulary is highlighted, student learning is documented, and key concepts are emphasized. Students use the Compendium almost daily to connect new information to previously learned information, creating a solid understanding of the concept to support them as they develop their

foundation in mathematics. In classes with students of varying levels of language proficiency, a focus on the big ideas helps ensure that all students understand the key points of the unit. Examples presented in class are explicitly connected to the larger mathematics concepts on the Compendium. This chart also supports students in building the academic mathematics vocabulary and language structures they need to be able to communicate their ideas. With a strong "big picture" foundation, students' proficiency increases as they are able to demonstrate their knowledge on a variety of assessments, leading to higher student achievement.

Unit Lessons

The unit lessons are where teachers and students work toward mastery of content. These lessons provide the direct instruction, problem solving, hands-on practice, and application that students need to move toward proficiency with the standards. An emphasis is placed on developing students' conceptual understanding before moving to skill practice and algorithms. Students are far more likely to retain information and to understand how concepts in mathematics are interconnected if conceptual understanding is prioritized first (Van de Walle, 2013) and connected with previous understanding (Medina, 2008).

In some districts a specific program, aligned to the standards, drives many of the unit lessons. In other districts, teachers pull from many resources to build lessons that meet the identified CCSSM for their unit. AIM4S^{3}™ supports teachers with planning in either of these situations. By carefully backwards planning the unit (see page 56) teachers know the standards, build the Compendium, identify assessments, and plan for the specific needs of their students. Teachers do not just march through the unit lessons in their program. They make informed professional decisions about their unit lessons to best meet the needs of their students and to maximize instructional time.

The Key Instructional Principles are evident throughout unit lessons. Sheltering to give students access to content and language is carefully planned, as are activities and experiences that scaffold students' conceptual understanding of mathematics. Students have multiple and varied opportunities to process information both orally and in writing (Student Output). A Positive Classroom Culture can be sensed as you walk in the room, allowing for risk taking and student voice. Continuous Feedback is visible in the use of formative assessment to guide teaching and learning and in the use of lesson level goal setting to build a community of learners. Teacher Mechanics and Delivery are evident in the instruction and the preparation of the teacher.

> It is well known that students who use strategic approaches to learning will comprehend spoken and written language more effectively, learn new information with greater facility, and be able to retain and use their second language better than students who do not (Calla, 1994; Marzano, 2003). Metacognitive, cognitive and social/affective strategies represent the dynamic process underlying learning. Modeling and teaching these strategies helps students to become active, effective learners while supporting their practice and use of academic language in the mathematics class and across other disciplines.

Unit lessons connect to the Focus and Motivation activities previously done and include additional activities, songs, videos, etc. that support students throughout the unit. The Compendium is a living chart during unit lessons, with teachers modeling for students how to use it as a resource and continuing to add sketches and highlighting to support learning. The standards/mathematical practices are addressed and explained so students understand the grade level expectations. This processing of the Compendium includes going back to the inquiry chart with students adding and revising to what they "know" and answering their own questions based on their new learnings.

Grouping during unit lessons varies and includes a gradual release of responsibility (whole group, small group and individual practice). Carefully planning activities that support scaffolding students' mathematical understandings and giving them varied opportunities to practice and apply these understandings is key to students meeting the CCSSM and building a strong mathematical foundation.

Flexible groupings are used to support student learning as well. Small group guided math groups provide targeted instruction for students to fill gaps from previous grade levels as well as to support students with current content. These look different across the grade levels, but even in middle and high school a few minutes of instruction that specifically addresses the needs of a small group of students can help students make large gains and strengthen conceptual understanding from previous years.

Closing

The closing contains two components that are designed to solidify connections and ideas for students and provide the opportunity for reflective goal setting. The first component, closure, connects students to the initial Focus and Motivation experiences and activities to clarify and reinforce students' end understandings. Goal setting, the second component, provides students with the opportunity to reflect on their progress and to action plan for the next unit. Students study their academic data and reflect on which strategies support or inhibit their learning, which skills they need to work on, and how their actions and attitude impact their progress. Goal setting and reflection celebrate student progress and heighten awareness of the important role students play in their own learning.

The next two sections of the monograph describe both the Key Instructional Principles and the AIM4S³™ components in greater detail. The case studies that follow these sections offer a window into model implementation by classroom teachers.

AIM4S³™ Three plus Three Training Model (3+3)

The AIM4S³™ Training Model includes two distinct components:

1) An exciting, collaborative three-day training and workshop that includes a framework overview of the Key Instructional Principles and Components, as well as supporting data, classroom demonstrations, and collaborative planning time; and

2) A minimum of three one-day follow-up trainings designed to respond to the particular needs of the school and district implementing AIM4S³™ and often focused on: planning using the CCSSM, sheltering and scaffolding unit lessons, developing and sustaining a positive classroom culture, or providing coaching to teachers in their classrooms.

Research has found that sustained professional development is essential to make long-term changes in instructional practice that increase student achievement (Darling-Hammond, 2010). AIM4S³™ makes a difference with teachers and students when teachers are given the professional development and support to truly implement this framework.