Khan Academy Districts

Develop Academic Math Language Through Visuals, Manipulatives

Khan Academy's Algebra 1 TEKS-aligned course provides multiple, consistent opportunities for students to develop academic mathematical language through the use of visuals, virtual manipulatives, graphical representations, structured sentence frames, conceptual prompts, and vocabulary-rich supports. These features help students connect mathematical ideas to precise mathematical terminology, aligning with TEKS expectations that students communicate clearly and accurately about mathematical concepts across representations.

Use of Visuals to Develop Academic Mathematical Language

Khan Academy embeds visuals throughout Algebra 1 instruction that support students in learning and accurately using mathematical vocabulary. Across the course, students:

- Use graphical representations (coordinate graphs, scatterplots, function transformations) to describe features using precise terms such as slope, intercept, maximum, vertex, zeros, domain, and range.
- Interpret visual function models and describe them using vocabulary aligned to TEKS (e.g., "The graph opens downward," "This interval is increasing," "The vertex is located at…").
- Work with tables, diagrams, and models that support vocabulary learning such as constant rate of change, growth factor, line of best fit, correlation, or parabola.
- Use color-coded graphs and visuals that highlight relationships and help students articulate academic language more meaningfully.
- Engage with step-by-step visual demonstrations that model vocabulary in context and reinforce correct usage.

These opportunities align with TEKS such as:

- A.1(E): communicate mathematical ideas using multiple representations
- A.3(B): describe slope and intercept using academic language
- A.5(B), A.6(A): use visuals to describe function behavior
- A.12(A): use vocabulary to describe data relationships

Questions? Contact us at
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Use of Manipulatives or Representational Tools for Language Development

Although Khan Academy does not use physical manipulatives, it incorporates virtual manipulatives and representation tools that play a similar role in supporting language development. Students:

- Use virtual algebra tiles and area models to describe factoring in academic language (e.g., "The dimensions of the rectangle represent the binomial factors").
- Manipulate interactive graphs to observe and verbally describe transformations using terms such as *vertical shift*, *reflection*, or *stretch*.
- Use sliders to adjust parameters and then describe changes to graphs using formal vocabulary (e.g., "Increasing *a* narrows the parabola").
- Engage with table-building tools to use vocabulary like *rate of change*, *constant rate*, or *exponential factor*.
- Work with interactive line of best-fit tools to describe correlation, trend, and residuals using appropriate terminology.

Language Development Strategies Embedded in Tasks

Khan Academy lessons scaffold academic vocabulary and discourse through tasks that prompt students to verbalize reasoning, explain representations, and apply mathematical language in context. Students are prompted to:

- Use sentence-framing prompts in question explanations (e.g., "The graph represents... because..." or "The vertex tells us...").
- Read vocabulary-rich explanations that model the use of academic language clearly and consistently.
- Engage with guided hints that incorporate mathematical terminology and model precise communication.
- Explain *why* a model, representation, or method is appropriate using formal vocabulary (e.g., "A linear model is appropriate because the rate of change is constant").
- Articulate relationships between forms (graph → equation → table) using TEKS-aligned terms.
- Use vocabulary in context-based questions, reinforcing meaning rather than rote recall.

These practices directly support TEKS such as:

- A.1(C), A.1(G): using precise mathematical language to justify reasoning
- A.3, A.5: communicating meaning of representations using academic vocabulary
- A.12: describing data and model fit through statistical language

Integrated Connections Between Visuals and Academic Language

Khan Academy's structure consistently integrates visuals with opportunities for students to develop and use academic language. Students regularly:

- Interpret a visual model (graph, table, diagram) and then explain it using precise vocabulary.
- Transition from representational models (e.g., graphing a system) to explanatory tasks requiring academic language (e.g., describing what the intersection represents).
- Move from visual transformations to symbolic descriptions, using academic terms such as *horizontal shift*, *axis of symmetry*, or *growth rate*.
- Link real-world visuals (scatterplots, modeled data) to mathematical language such as *correlation*, *trend*, or *residual*.