

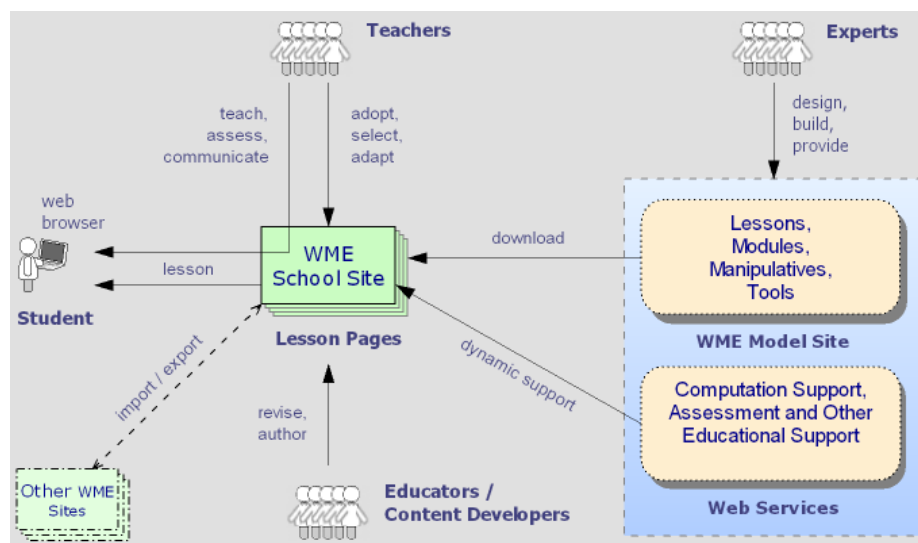
Technical Advantages of WME

A Look under the Hood

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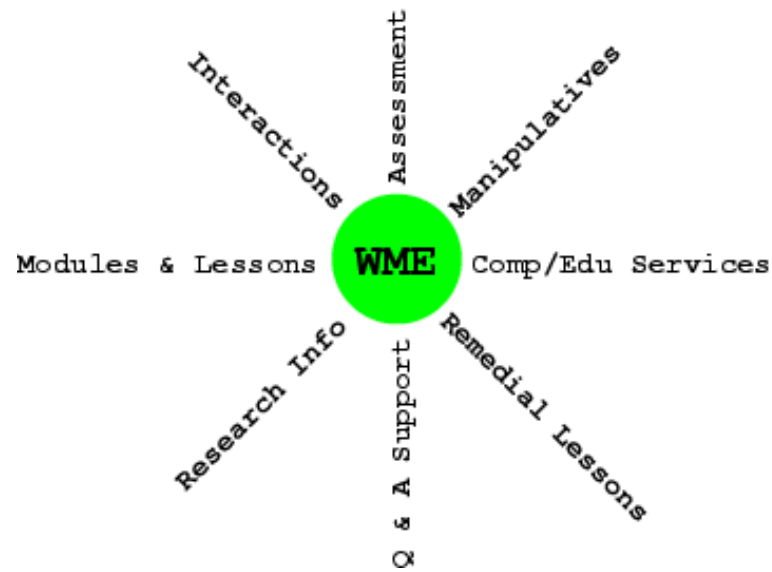
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The WME Concept



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The WME Integration



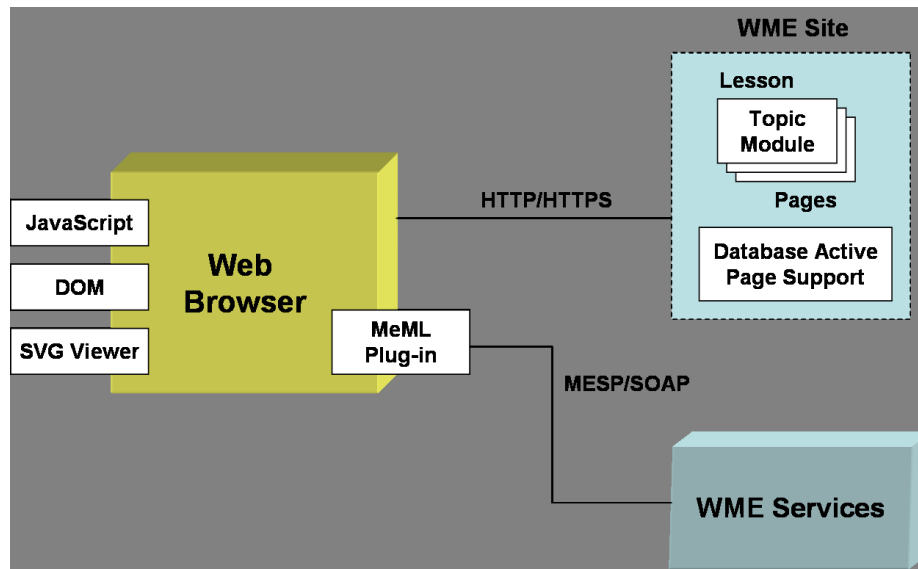
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Important Technical Characteristics of WME

- Open-source and compliant to open standards.
- Leading-edge support for mathematics: formula representation, editing, and display; interactive geometry; graphing/plotting; animation.
- Interactive, integral, self-contained, and classroom-ready.
- Easy to configure and customize at multiple levels.
- Interoperable modules, lessons, manipulatives, tools, and services.
- School-centered: WME sites are deployed and operated per-school.

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The WME Architecture




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WME Components

- *Manipulatives, Active Lessons and Topic Modules*
- Teacher guide and assessment support
- Client-side Support—regular browsers, javascript, SVG viewer, DOM, browser plug-in.
- Server-side Support—active pages, database
- Content-markup Support—MeML, page translation and MESP service access.
- WME Services—MathGlossary, MathChat, MathBoard, ...
- Protocols—MESP, MCP and SOAP/REST.

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Manipulatives



Roll [Start Over](#)

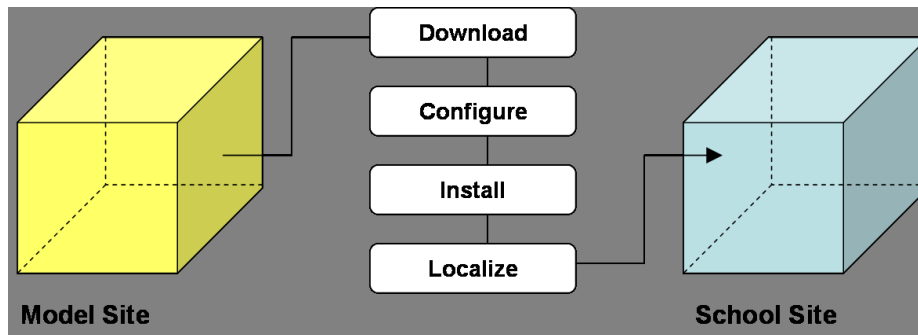
Roll count (the number of rolls you made): 0.

Sum	2	3	4	5	6	7	8	9	10	11	12
Count	0	0	0	0	0	0	0	0	0	0	0

[Example 1](#), [Example 2](#), [Example 3](#).

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WME Model Site Download



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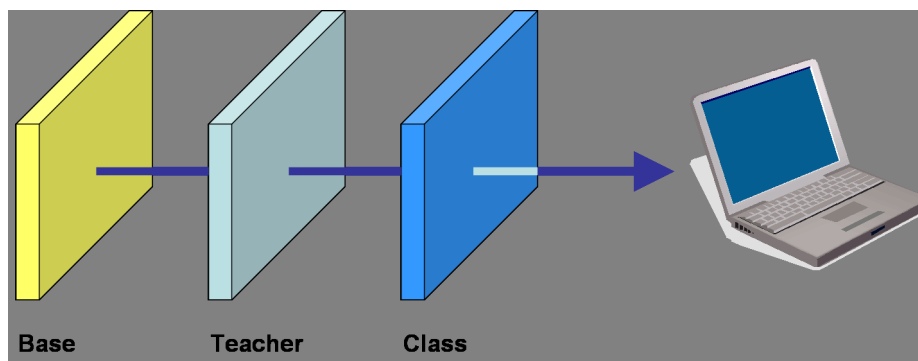
WME Customizations

- For each school—user accounts, grade levels, course listings, course sections.
- For each course—TM and AL selection, student list.
- For each lesson—manipulatives editing: including text, presentation, and functionality, assessment and challenge questions.

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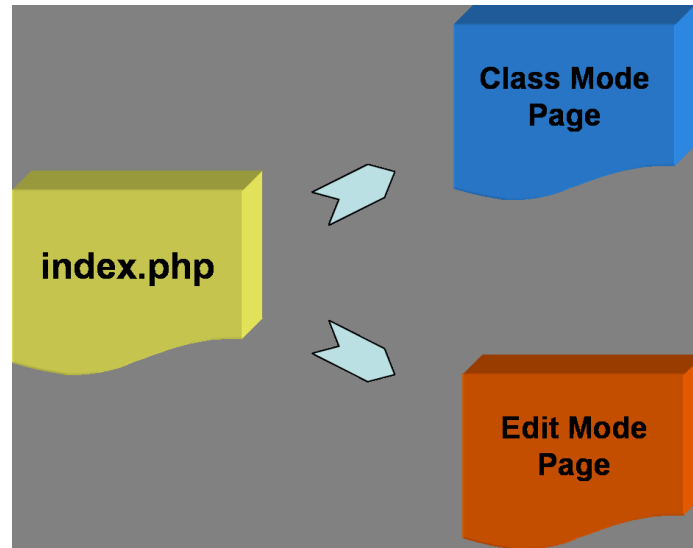
Page Customization Layers

Customizations are per-teacher and per-class.



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Dynamic Page Generation



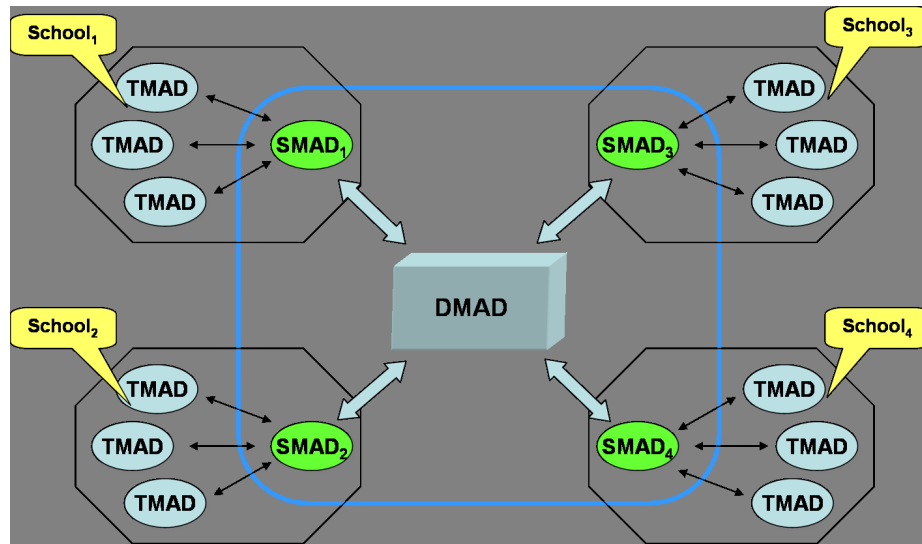
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Assessment Help and Automation

- Test authoring, construction, and editing
- Online test taking
- Importing and exporting test questions
- Automatic grading and test data management
- Results evaluation, diagnoses and suggested interventions

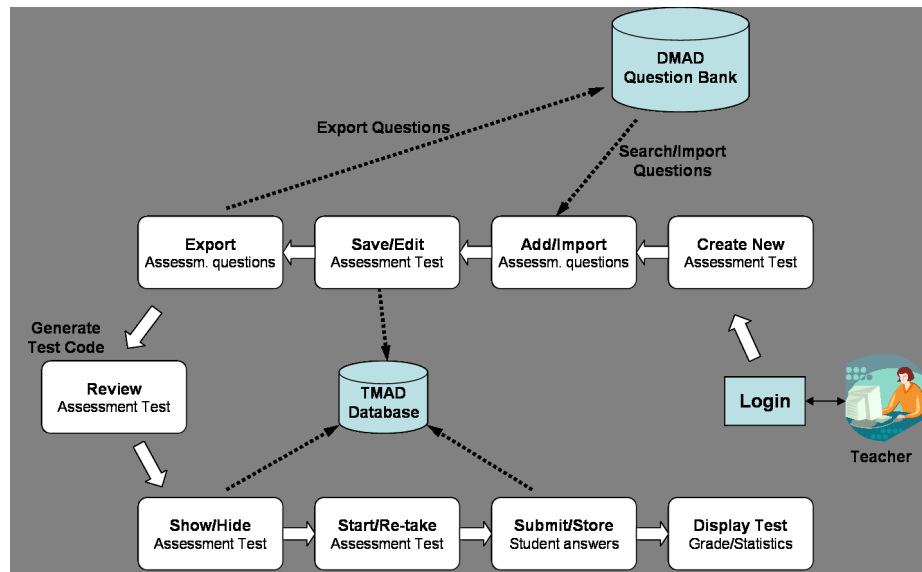
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DMAD Architecture



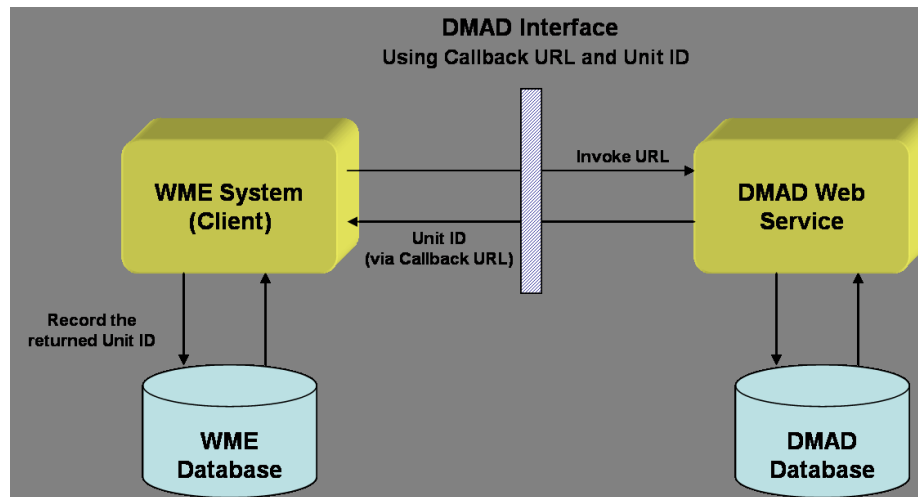
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DMAD Functionalities



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DMAD-Application Interface



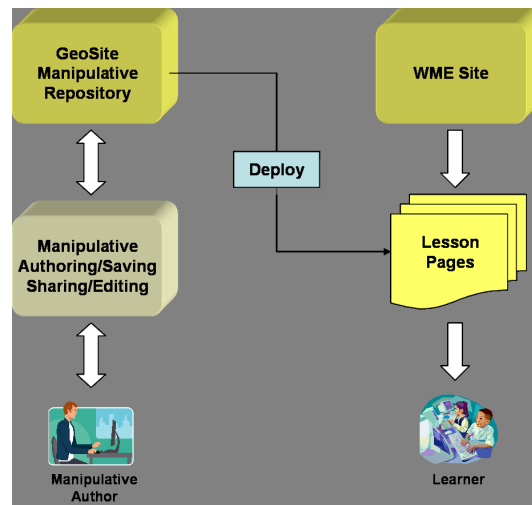
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SVG-Based Interactive Geometry

- Scalable Vector Graphics is an emerging W3C standard.
- Compactly delivers interactive graphics to support authoring and running manipulatives.
- Geometry-aware manipulatives support constraint-preserving user operations.

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GeoSVG Usage Overview



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GeoSVG

GeoSVG is an interactive geometry teaching/learning system providing supports for

- Authoring and running of manipulatives
- Repository of manipulatives for teaching, learning, sharing.
- Online submission of diagrams in homework and tests.
- Diagram drawing in different tools such as Drawing Tablet, Assessment, Bulletin Board

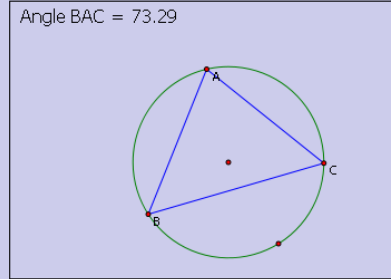
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A GeoSVG Generated Manipulative

Inscribed Triangle of a Circle

A triangle is inscribed in a circle if all three of its vertices are on the circle.

1. An inscribed triangle is shown in the following diagram. You can drag the vertices to change the triangle.



The diagram measures the angle BAC. Make BAC a right angle. This can be done in many ways. What observations do you have when BAC becomes a right angle?

BC is a diameter

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Another Manipulative

Base = 4.70 Height = 2.16
 Area of the Parallelogram = 10.14
 Area of the Rectangle = 10.14

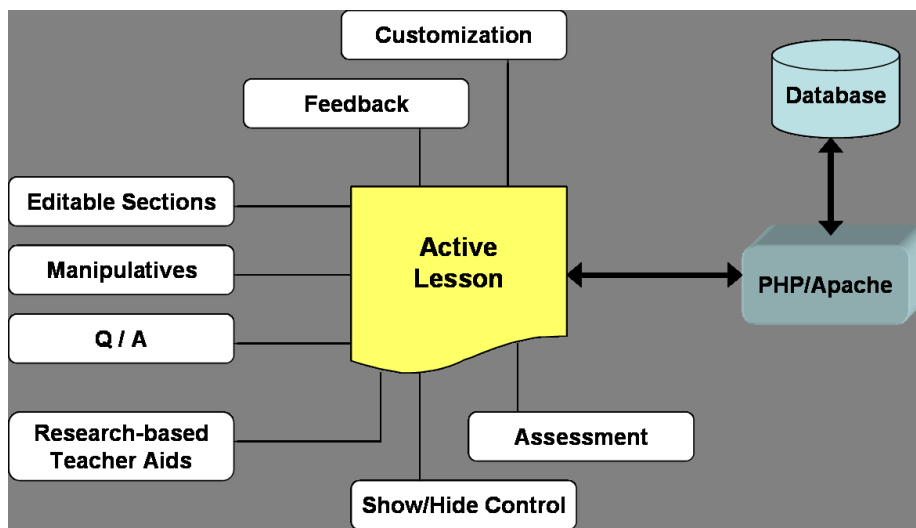
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WME Interoperability

- Basic WME iop comes from the interoperability offered by the Web and Internet
- On top of that, we want to make WME components interoperable in many ways:
 - modular, package, object-oriented organization
 - portability of components
 - mutual reinforcement among components
 - plug-and-play as much as possible
 - easy configuration, customization, mix-and-match, import and export
 - compatible interfaces; reuse of programs
 - systematic extension and expansion of capabilities

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Interoperable Modules and Lessons



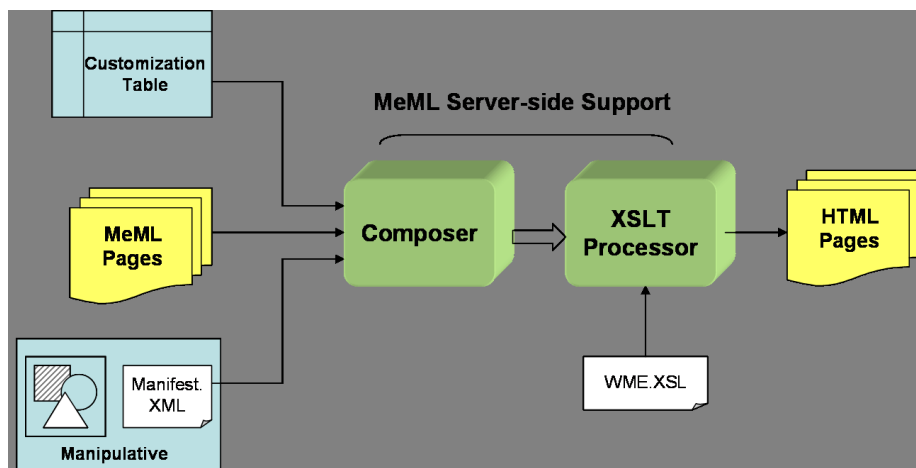
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Mathematics Education Markup Language

- Content markup—An XML application designed specifically for organizing and structuring on-Web Mathematics teaching documents.
- Page generation—PHP library to translate and process MeML documents into Web pages for delivery to browsers.
- MESP service access—Javascript to enable access of any service via the Mathematics Education Service Protocol from MeML-coded documents.

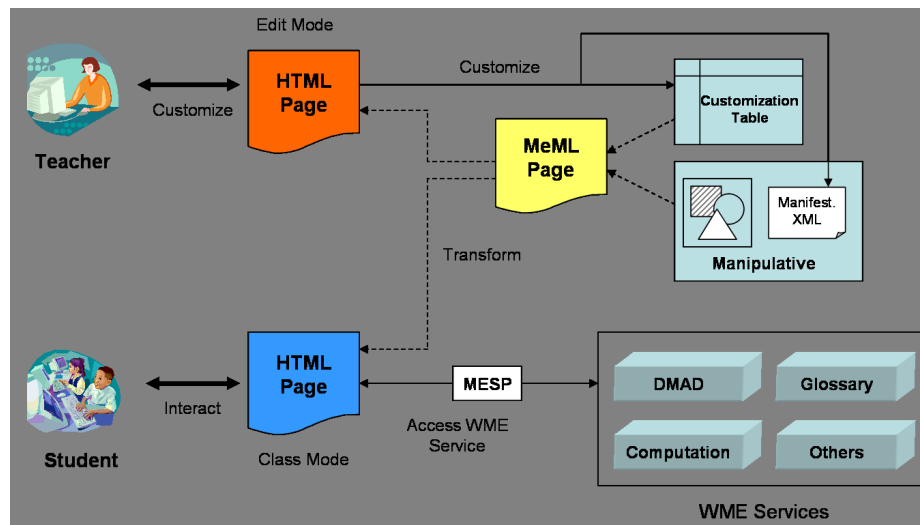
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MeML Server-Side Support



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MeML Client-Side Support



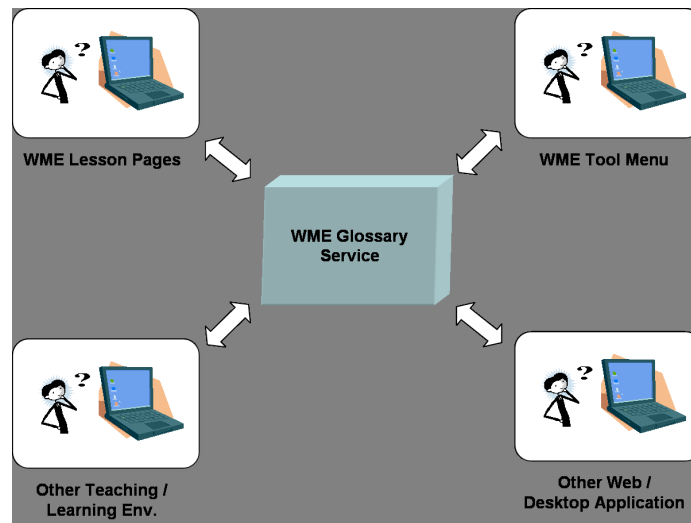
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WME services

- Mathematics glossary
- Plotting/graphing
- Simplification
- Formula editing

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Mathematics Glossary Service



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MathChat and MathBoard

- MathChat encourages student participation in topic discussions
- MathChat simulates classroom teacher-student interactions.
- MathBoard encourages student-student interactions and generally facilitates communication among all in the class.
- Both will support Math input and display.

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Making It Easy

