# mathAscend™ Teacher Guide:

AppleSTEM
"An essential part of an effective education"

Assessment Applications for Science, Technology, Engineering, and Mathematics Learning

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*Where students, parents, and teachers get the resources they need to enhance student learning.*

**Who we are:**
AppleSTEM is a 501(c)3 non-profit organization that envisions a world where every student, regardless of physical ability or socioeconomic status, has the opportunity to receive personalized guidance in the pursuit of learning.

**What we do:**
AppleSTEM develops and provides at no cost math and science problem-solving resources to students, parents, and teachers.

**Articles**

"3 Effective Assessment Strategies to Improve Student Learning"

--Coming Soon--

"Avoiding the Summer Learning Loss"

"Incorporating Free Online Educational Resources (OER) into your Math Curriculum"

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## Getting Started

The mathAscend™ website is accessible by going to applestem.org and clicking on **Visit the Public/Private School Site** located on the left-hand side of the screen.

When you arrive at the landing page click on **Login** located in the upper right-hand portion of the screen. You will then be prompted to enter your login credentials.

Teachers: email address and password

If you do not have valid login credentials, click on **Contact Us** to notify AppleSTEM.

## Dashboard Features

Logging in will take you to your personal dashboard. From here a couple of features from the landing page are still available to you: 1.) you can still learn **About** AppleSTEM and 2.) you can still **Contact Us.** In addition, you can leave your account by clicking on **Logout.** This will take you to the mathAscend™ landing page. All three of these features are accessible in the upper right-hand portion of the dashboard. Other features available from your dashboard are described below.



### Teacher Code

Directly beneath **Dashboard** appears your **Teacher Code** (in the above example it is *Entwhistle99902*). Your Teacher Code is unique to you and consists of your last name followed by a 3 – 5 digit number. The teacher code is used primarily when you have a student who does not have a mathAscend™ account. In that situation, the student would click **Sign Up** on the landing page and would need to submit your teacher code in order to create an account. Your teacher code should only be given to students who are enrolled in your course, but do not have a mathAscend™ account.

### Recent Student Activity

The most prominent item on your dashboard is the **View Most Recent Student Activity** feature. Here is where you can see which students have been accessing mathAscend™ problem-solving modules, the last topic that was accessed by that student, the date the module was accessed, and the amount of time the student spent within the module. The default setting is to list all of your students who have accessed a module. If there are no active students, then no students will be listed. However, you can select in which classes to view student activity by checking or un-checking specific courses and then clicking on **View**. Only students who have accessed at least one module and are enrolled in the selected class will appear.

### Send Message

The **Send Message** feature allows you to communicate directly with a set of students of your choice directly within the mathAscend™ platform. Each student you send a message to will see that message on her/his dashboard upon logging in. The communication is one way: you can send messages to

students, but they cannot send messages to you. The system is set-up this way so as not to inundate the teacher with student messages.

To send a message click on **Send Message** located directly to the right of **Dashboard**. You will be taken to the send message feature.
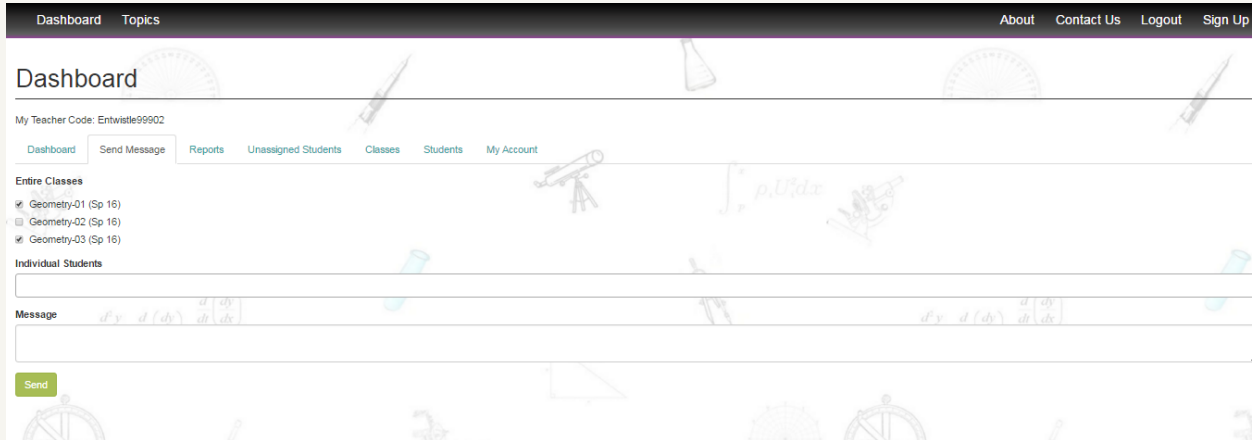


To send a message select the desired recipients. They can be selected by class or as individual students. To select a class click on the checkbox associated with a particular class. All of the students enrolled in a course that has its box checked will receive the message. In the example above, students enrolled in Geometry-01 (Sp 16) and Geometry-03 (Sp 16) will receive the message. Alternatively, students can be selected individually. To do so, click inside the **Individual Students** field, a list of all your students will appear. Click on the name of an intended recipient. The student's name will appear in the recipient list. Click inside the Individual Students field again to see the list of you students and click on a particular name to add that student to the recipient list. A student can be removed from the list by clicking on the **'x'** directly to the left of her/his name. Selecting students individually allows you to select a limited set of students who might may or may not be enrolled in the same class. Selecting students by class or individually function simultaneously. That is, you can have all of the students from one class receive the message by clicking the check box next to that class and you can select some students from another class by selecting their names in the **Individual Students** field.

After the set of students has been selected, a message to them can be typed in the **Message** field. Click inside the field and type the message. Once the message is complete, clicking **Send** will deliver the message to the intended recipients' dashboard.

## *Reports*

Student proficiency reports are accessible by clicking on **Reports**. The reports feature allows you to monitor student proficiency **By Class**, **By Topic**, or **By Student**. Each category is a drop-down menu from which you can select a particular class, topic or student. Clicking on the corresponding **Go** button will allow you to view your students' proficiency reports in the desired format.
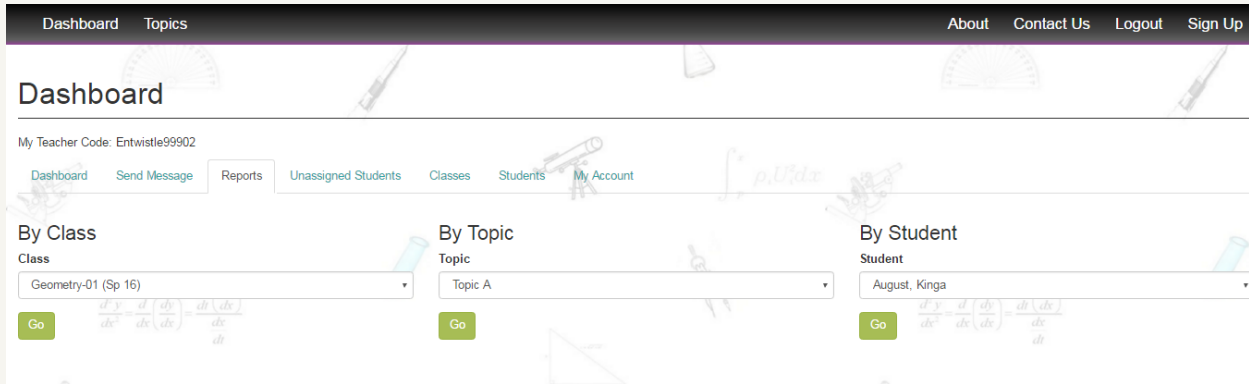
A student's proficiency level will be viewable only if she/he has accessed a problem-solving module or has taken a quiz associated with a particular topic. When the **By Class** format is selected, the proficiency levels of the students within a particular class are displayed. The **By Topic** format displays the proficiency level of all of your students (regardless of which class they are in) who have accessed that topic either through the problem-solving module or through the quiz mode. When a specific student is selected via the **By Student** feature, her or his proficiency level is displayed for all topics accessed either through the problem-solving module or the quiz mode.

The figure below displays student proficiency levels in the **By Class** format.



All of the students in the selected class who have accessed at least one problem-solving module or quiz for a topic are listed in **Reports**. Each student is listed by name and for each student the following items are displayed: 1.) the topics accessed by the student, 2.) the proficiency level of the student for a particular topic, 3.) the student's last quiz score for a topic and 4.) if the student has taken more than one quiz for a topic, the difference in scores (gain) between the most recent quiz and the immediately preceding quiz. In addition, the students' detailed performance within a problem-solving **Module** or a **Quiz** can be accessed via the **Detailed Report** feature.

**Proficiency Level**:  Students' proficiency with a topic is described along five levels: beginning (**B**), emerging (**E**), developing (**D**), proficient (**P**), and highly proficient (**H**). All students enter a topic at the beginning proficiency level. As the student solves more problems correctly, mathAscend[TM] adjusts the

proficiency level accordingly. Students who have achieved proficiency levels of proficient (**P**) or highly proficient (**H**) should be regarded as having mastered the topic and are ready to be formally tested on the material.

Students' proficiency levels are communicated as both **Working** and **Assessed** proficiencies. Working proficiencies are indicated by a blue diamond and are a measure of student performance within the problem-solving module. Assessed proficiencies are represented by a yellow diamond and are a measure of student performance in the quiz mode.

**Detailed Report - Module**:  A student's work in a problem-solving module and her or his performance is recorded in the detailed module report. Every time a student accesses a problem-solving module and is active within the module mathAscend™ generates a new detailed report.

**Detailed Report - Quiz**:  A student's performance on a quiz and the work she or he did while solving the quiz problems is recorded in the detailed quiz report. Every time a student takes a quiz mathAscend™ generates a new detailed report.

## *Unassigned Students*

Students who were included in the Student List provided to AppleSTEM by the school, but were not assigned to a particular class (or who did not know which class to select when signing up) are grouped as **Unassigned Students**. A teacher can move one or more unassigned students from the unassigned pool into a specific class by selecting the checkbox next to the student's name, selecting the particular class from the drop-down menu, and then clicking **Submit** (a fictitious example is provided below).

### Unassigned Students

These students belong in your school but are not in a class.

| | Name | Username | Student ID |
|---|---|---|---|
| ☐ | Austin, Marek | 645ausmar | 13095457 |
| ☐ | Buy, Kalley | 555buykal | 12875893 |
| ☐ | Byers, Margaret | 591byemar | 13027636 |
| ☐ | Cabrales, Emily | 981cabemi | 13093398 |
| ☐ | Danilowski, Colleen | 184dancol | 13065733 |
| ☐ | De La Torre, Marta | 135demar | 13123929 |
| ☐ | Easterday, Jessica | 423easjes | 13061966 |
| ☐ | Escobar, Min | 289escmin | 13091265 |
| ☐ | Frohm, Peter | 816fropet | 13097685 |
| ☐ | Galasso, Megan | 714galmeg | 13015343 |
| ☐ | Gupta, Alexandra | 240gupale | 13059395 |
| ☐ | Newhart, Bob | valdomin222 | 2222222222 |

Move to class:

Pre-algebra-01 (Sp 16)            ▼

Submit

## *Classes*

Clicking on **Classes** displays the teacher's classes. The **Classes** feature allows the teacher to create a new class. Once the class has been created, the teacher can either move students from the teacher's other classes into the new class, or move students from the **Unassigned Students** pool into the new class, or both. This feature can be used to group students from different classes into the same "class" to more easily monitor their collective performance and to more conveniently communicate with them as a group.

## *Students*

The **Students** feature lists all of your students from all of your classes alphabetically. The **Students** page provides the student's last name, first name, ID number, and the class to which the student is currently assigned.

In addition, there is an **Edit** feature that allows you to change a student's information: last name, first, ID number, username, and password. Students cannot change their usernames, but the teacher can change it for them. If a student forgets her or his password, the student should notify the teacher. The teacher can then go into the **Edit** feature of **Students** and create a new password.

Through the **Edit** feature, the teacher can move a student from one class to another using the drop-down menu. Here is where the teacher can also grant or deny access for a particular student to mathAscend ™.

The teacher can also move a student into the group of **Unassigned Students** by clicking on **Move to Unassigned Pool**. BE CAREFUL – THIS ACTION IS IMMEDIATE. IF THE BUTTON IS CLICKED, THE STUDENT WILL BE MOVED. ONLY CLICK **MOVE TO UNASSIGNED POOL** IF YOU WISH TO HAVE THE STUDENT MOVED.

If the **Move to Unassigned Pool** button is accidently clicked, the student can be moved back into the appropriate class by going to **Unassigned Students** and re-enrolling her/him from there.

## *My Account*

In **My Account**, you can change your first name (you might want to use a nickname). Here also is where you can change your password: type in a new password in the **Password** field, type it again in the **Confirm Password** field, and then click **Save**. The new password will only take effect if both the **Password** and **Confirm Password** fields contain identical texts. If no new text has been added to both fields, then the old password will remain in effect.

# Problem-Solving Modules and Quizzes

Problem-solving modules and quizzes can be accessed from the Dashboard by clicking **Topics**. Individual topics are grouped into the following categories: Pre-Algebra, Algebra 1, Geometry, and Algebra 2. Clicking on one of these will take you to that category's topic list.

In the figure below, the Pre-Algebra category was selected and the topics for Pre-Algebra are displayed. On this page, the other categories are still accessible to the user.

## Categories

Pre-Algebra | Algebra 1 | Geometry | Algebra 2

## Pre-Algebra

| Topic | Common Core Standards | Problem Set Module | Take Quiz |
|---|---|---|---|
| Rounding | 5.NBT.4 | Problem Set Module | Take Quiz |
| Combine Like Terms (PA) | 6.EE.4 | Problem Set Module | Take Quiz |
| Prime Factorization | 6.NS.4 | Problem Set Module | Take Quiz |
| Greatest Common Factor | 6.NS.4 | Problem Set Module | Take Quiz |
| Least Common Multiple | 6.NS.4 | Problem Set Module | Take Quiz |
| Order of Operations (PA) | 5.OA.1 , 6.EE.2.c , 7.NS.2.c , 7.NS.3 , A.SSE.1.a | Problem Set Module | Take Quiz |
| Fractions - Understanding Fractions | 7.NS.2.b , 6.NS.1 | Problem Set Module | Take Quiz |
| Fractions - Operations | 7.NS.2.c , 7.RP.1 , 6.NS.1 | Problem Set Module | Take Quiz |

Underneath the display of the category selected is a list of its corresponding topics. Each topic has associated with it the **Common Core Standards** addressed by that topic, a link to the topic's **Problem Set Module**, and a link to the quiz module (**Take Quiz**).

## *Problem Set Module*

The **Problem Set Module** is where the user can practice solving problems to develop her/his problem-solving skills. Students' performance in this module is represented in the proficiency report as the **Working Proficiency** (blue diamond).

| Mode | Module | | Name | Simplifying Square Roots (A1) | | Proficiency | B | E | D | P | H |

**Computer's Question**

Simplify: $\sqrt{60}$

**Computer's Answer**

View all computer steps first

**Computer's Work**

Click "Show Next Step" below to see a hint.

**Your Question**

Simplify: $\sqrt{72}$

**Your Answer**

Answer

Submit

**Your Work**

Work

Add

**Math Input**

| cos | sin | tan | Θ |
| { | } | |a| | , |
| ( | ) | x | y |
| [ | ] | z | π |
| $a^b$ | $\frac{a}{b}$ | ∠ | / |
| < | > | Δ | ~ |
| ≤ | ≥ | $x^{\circ}$ | Ø |
| √ | $n\sqrt{}$ | ∴ | ≅ |
| 7 | 8 | 9 | ÷ |
| 4 | 5 | 6 | × |
| 1 | 2 | 3 | − |
| 0 | . | = | + |

**Questions Taken**

0 / 90

Show Next Step

New Problem

Leave Module

Take Quiz

In this module, the user is presented with a problem to solve (**Your Question**). There is an **Answer** field in the **Your Answer** box where the user can type her/his answer. Below the **Your Answer** box is an area

where the user can show her/his work (**Your Work**). When the **Submit** button is clicked, mathAscend$^{TM}$ records what the student typed in the **Work** area. All mathAscend$^{TM}$ problems are open-entry; the user must type the answer into the **Answer** field. All problems allow for the user to show her/his work. Although teachers have access to the problem-solving modules and can solve problems just like a student, mathAscend$^{TM}$ does not store teacher performance data, or teacher work. The **Math Input** allows for entry of numbers, letters, and certain math symbols into the **Answer** and **Work** fields. These fields also accept entry from the device's keyboard.



To the right of the **Math Input** pad is a control panel that allows the user to do the following:

**Show Next Step** – if the user would like to see how the computer is solving its problem, she/he can click on **Show Next Step** and a single step of the computer's problem-solving process is revealed in the **Computer's Work** area. The user controls when a step is revealed. When the computer has reached the final step in solving its problem, the correct answer appears in the **Computer's Answer** box and **Show Next Step** changes to **No More Steps**.

**New Problem** – the user can at any time switch to a new problem by clicking on **New Problem**. When **New Problem** is selected, any student work associated with the current problem is not recorded and mathAscend$^{TM}$ records the problem as being skipped and is indicated as such in the detailed module report.

**Leave Module** – clicking on **Leave Module** takes the user out of the problem-solving module and directs them to the **Topics** page from which they selected the topic to work on. When the user clicks **Leave Module**, any information in **Work** and **Answer** fields is lost and the problem is recorded as skipped.

**Take Quiz** – at any time while working in the problem-solving module, the user can elect to take a quiz on the topic by clicking on **Take Quiz**. A dialogue box will appear asking the user if she/he wishes to take a quiz. If the user selects **Cancel**, she/he will remain in the problem-solving module. Selecting **OK** will direct the user to the **Quiz Module**.

Near the top of the module are three indicators: **Mode**, **Name**, and **Proficiency**. The mode indicates that the user is in the problem-solving module, the name provides the name of the topic, and the proficiency highlights one of the five letters to indicate the user's current working proficiency. When the user moves the cursor over a letter in the proficiency bar, a brief description of that proficiency level appears.
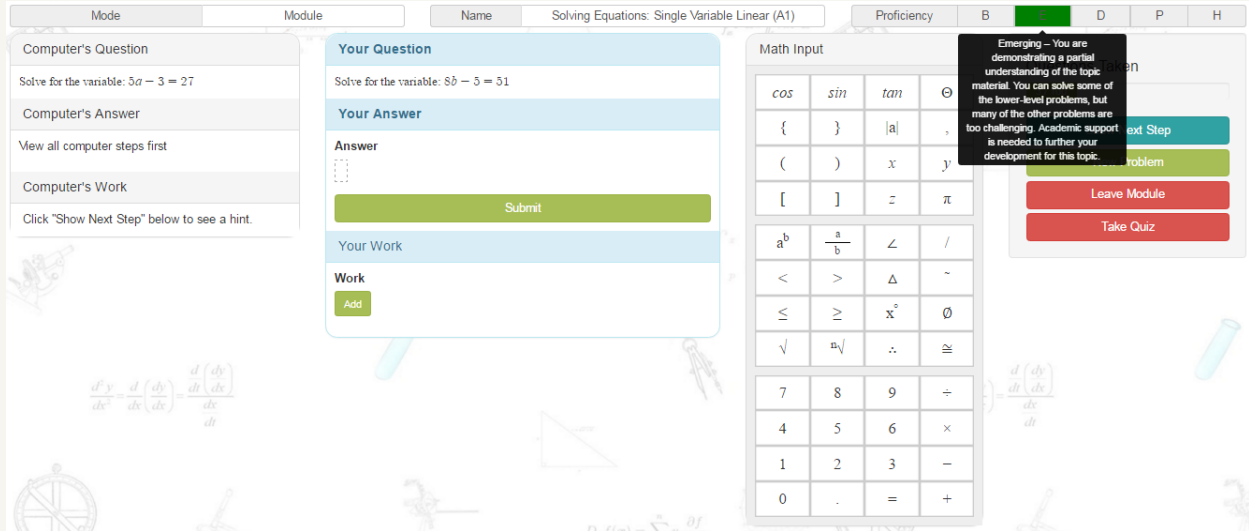


## Quiz Module

The **Quiz Module** can be accessed either through **Topics** or within a **Problem Set Module**. Within the **Quiz Module**, the user has 30 minutes to solve 10 problems. The user is provided with both a time counter and a problem counter in order to keep track of the time and progress.
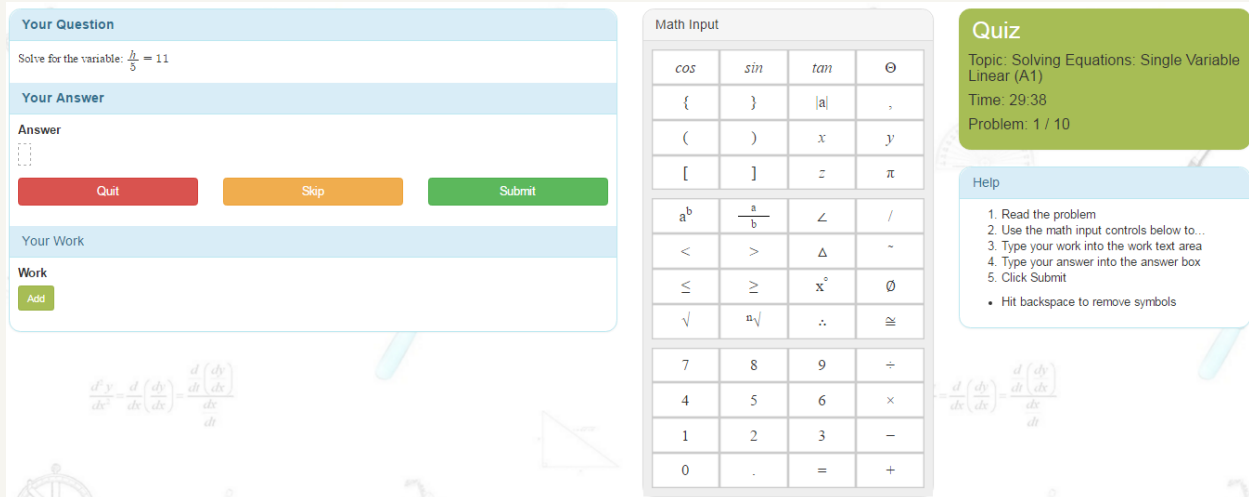


The **Quiz Module** has a similar structure to that of the **Problem Set Module**. The user is provided with a to solve. **Answer** and **Work** fields are also provided. The input pad in the quiz module is the same as the one in the problem-solving module.

In the quiz module, the user has one of three options: 1.) solve the problem and submit an answer using the **Submit** button, 2.) skip a problem by clicking on **Skip**, or 3.) exit the quiz module by clicking on **Quit**.

If the user clicks on **Skip**, the computer will go on to the next problem (the skipped question is counted as one of the ten problems in the quiz set). The computer records that problem as being skipped by the student in the detailed quiz report. If the user clicks on **Quit**, she or he is immediately directed to the **Topics** list.

## Supported Teaching Strategies

MathAscend$^{TM}$ supports at least eight different teaching strategies that the teacher can employ to support an engaged active-learning classroom and foster personalized learning both within and outside the classroom.

### Teacher Modeling

The teacher can access problem-solving modules from her or his mathAscend$^{TM}$ account and project the problem for the whole class to see. The teacher can model the proper steps to solve the given problem and/or solicit participation from the class while problem solving.

### Flipped Classroom

Students can be assigned topics to work on outside of class. When the class meets, the students and the teacher can participate in an in-depth discussion of the concepts related to the topic. The teacher can monitor each student's proficiency level and adjust the instruction accordingly: students who have already demonstrated a high proficiency level for the topic might be assigned a new topic to explore, students who have demonstrated a low proficiency could be assigned to work on perquisite topics or engage in more structured learning activities, and students who are somewhere in-between might need a few questions answered by the teacher to help deepen their understanding.

### Personalized Learning

MathAscend$^{TM}$ is designed to support personalized learning. Students can proceed at their own pace through the problem-solving modules. They can control the amount of information the computer provides when showing the student how it solved its problem. Students can strengthen previously learned skills and concepts by reviewing topics that they have had in the past. Or, on their own, they can explore higher level skills and concepts that might not be suitable for everyone in the class. Students can keep track of their development through the proficiency reports and can take a quiz on specific topics when they believe that they are ready.

### Differentiated Learning

The mathAscend$^{TM}$ platform greatly facilitates differentiated learning. The teacher can group students together based on their proficiency levels for a given topic. The teacher can then adjust the teaching and learning activities accordingly for each group.

### Scaffolding

The mathAscend<sup>TM</sup> problem-solving modules are structured to offer teacher/student side-by-side problem solving. In this case, mathAscend<sup>TM</sup> takes the role of the teacher. Within the module, the student and the teacher are given different, but very similar problems to solve. The student controls the amount of scaffolding provided by mathAscend<sup>TM</sup>. The student can receive a hint by seeing how mathAscend<sup>TM</sup> is solving its problem, but mathAscend<sup>TM</sup> does not give the student any hints on solving her or his own problem. Thus, the student must translate the computer's problem-solving behavior into a useful strategy to help solve her or his own problem. This leads to deeper processing and more meaningful learning.

### Cooperative Learning

Students can work together while accessing their own modules. Questions are presented randomly within a skill level; this means that is very unlikely for two students to be working on the same problem at the same time. Students cannot simply copy from each other and expect to get the correct answer. This format allows for students to engage each other with respect to problem solving, resulting in a more cooperative learning environment.

### Inquiry

Higher-achieving students can be encouraged by the teacher to explore new more advanced topics on their own, at their own pace. Students have access to all mathAscend<sup>TM</sup> problem-solving modules and quizzes, not just those associated with their grade level or course.

### Remediation

Students who are operating at a low proficiency level for a given topic can be assigned remediation topics that serve as pre-requisites for the topic of interest by the teacher. Because mathAscend<sup>TM</sup> provides students complete access to all problem-solving modules and quizzes regardless of grade level, students can be assigned to work on topics outside of their grade level or course.

## Capable Assessments

MathAscend<sup>TM</sup> provides three types of assessment information: diagnostic, formative, and summative.

### Diagnostic

Diagnostic assessment can be used the following ways:

1. The teacher can assign a topic to the students prior to instruction to ascertain how well students already understand the material to be covered.
2. Diagnostic assessment can be used to determine readiness by assessing pre-requisite skills associated with a topic of interest. Students in need of remediation can be provided with additional support.

3. The teacher can use the proficiency reports to ascertain students' "exam readiness."
4. The teacher can examine the steps a student used when problem solving to diagnose misconceptions.

### *Formative*

MathAscend<sup>TM</sup> is capable of the following formative assessments:

1. While working in a problem-set module, students are given immediate feedback as to whether their submitted answer is correct or incorrect.
2. When a learner submits an incorrect answer, she or he is given the opportunity to see a correct solution path.
3. In the proficiency report, when the learner clicks on the detailed report for either a problem set or a quiz, the learner can compare her or his solution path to a correct solution path.

### *Summative*

MathAscend<sup>TM</sup> has a quiz feature. In the quiz mode students are given 30 minutes to solve 10 problems. Student's quiz performance in expressed in the proficiency report as the assessed proficiency (student's proficiency level determined through the problem-solving modules is expressed as the working proficiency). In addition to a proficiency level for a quiz performance, student's quiz scores and gain (the difference between successive quiz scores for a particular topic) are also provided.