



Crowdsourcing helped Pearson create the first personalized digital Common Core math curriculum that powers teaching, learning, and assessment—and optimizes time.

Pearson created an open forum for members of the global math community to participate in building Pearson’s new middle grades math program, *digits*. Anyone was able to submit ideas to <http://pearsonmath.ideascale.com>, regardless whether their idea was pedagogical or mathematical in nature – or whether they just wanted to make math more fun. 101 individuals voted over 700 times in response to the 39 ideas posted. The matrix below explains how these ideas have been implemented in *digits*.

Many thanks to every member of *team digits* for participating!

Your Idea	How Was the Idea Implemented?	Where Does It Appear in <i>digits</i> ?
<p>IMPROVING MATH FLUENCY</p> <p>Many mainstream math textbooks present their lessons by topic. Students complete a chapter and move on to another concept and won’t review that concept until the end of semester or maybe even the end of the year.</p> <p>Incremental rehearsal builds student fluency in basic math facts and concepts. I believe that students will experience a higher rate of success if Pearson adopted this model of intervention.</p>	<p>There are several elements within the <i>digits</i> program that foster improving math fluency. For example, each Readiness Assessment is an opportunity to check on foundational skills that students need to have to be successful for a math unit. The Readiness lesson suggested in the table of contents at the start of each topic is an opportunity to refresh, improve, and enhance those foundational skills so that every student can meet the expectations of the math content of the topic. <i>digits</i> includes a 100-lesson Intervention library, with focus on number system and expressions and equations to further support the math fluency students need coming into middle grades, and as importantly, aiming for success in high school algebra.</p>	<p>Readiness Tests in TOC Intervention TOC Readiness Lessons in TOC</p>
<p>INTERACTIVE MATH GAMES</p> <p>One of the critical parts of my middle school math is that of playing games to introduce and reinforce learning. Math needs to be interactive, not just lectures. Students need to take ownership in their learning.</p>	<p>The delivery environment of the <i>digits</i> program allows each lesson to be full of engagement for students. Animations, videos, and use of the interactive white board add engagement opportunities within the math classroom. Digital tools allow teachers to investigate ideas with students. Activities such as the vocabulary puzzles in the topic review have some interesting variations and even mystery puzzles for students to solve.</p>	<p>Every topic</p> <ul style="list-style-type: none"> • Gr 7 Topic 8 Lesson 3 • Gr 7 Topic 9 Lesson 3
<p>HOMEWORK HELP</p> <p>My daughter brings home work that I am not sure how to help her with. I would like to have access to a website that has video lessons for students and parents to watch at home.</p>	<p>The delivery environment for <i>digits</i> allows parents to fully participate in their child’s learning. Every lesson and homework exercise is available online, so parents can review with their child or even preview the lessons in advance. Every problem presented in the <i>digits</i> program includes a solution, which takes the mystery and frustration out of homework or work done outside of the classroom.</p>	<p>Entire program</p> <ul style="list-style-type: none"> • Gr 6 Topic 4 Lesson 4 • Gr 7 Topic 10 Lesson 3 • Gr 8 Topic 4 Lesson 4
<p>ADDING AND SUBTRACTING INTEGERS</p> <p>I taught my students a song to the tune of a familiar song to remember the rules for adding and subtracting integers.</p>	<p>The <i>digits</i> program includes characters and music to add interest and engagement for student understanding of a math concept.</p>	<ul style="list-style-type: none"> • Gr 6 Topic 2: Property Hero • Gr 7 Topic 13: Ms. Adventure • Gr 8 Topic 4: Mad Maxx

Your Idea

How Was the Idea Implemented?

Where Does It Appear in *digits*?

SIMPLIFYING FRACTIONS IDEA

I use manipulatives (candy) to have students write and simplify fractions for a project that can be done for Valentine's Day or any other time.

The digital tools within the *digits* program foster exploration for many of the middle grades concepts required of a Common Core program. They support the strands of the Common Core and include: pan balance, algebra tiles, integer chips, place value blocks, number lines, probability, 2-D and 3-D geometry, and graphing data. Enrichment activities for each unit provide the opportunity to apply the concepts of a group of related math topics to solve a bigger problem.

- Pan balance tool: Gr 6 Topic 3 Lesson 2
- Coordinate grapher tool: Gr 6 Topic 4 Lesson 2
- Area models tool: Gr 6 Topic 5 Lesson 4
- Number line tool: Gr 6 Topic 8 Lesson 1
- 2-D Geometry tool: Gr 6 Topic 13 Lesson 3
- 3-D Geometry tool: Gr 6 Topic 14 Lesson 3
- Data and graphs tool: Gr 6 Topic 15 Lesson 2
- Integer Chip tool: Gr 7 Topic 4 Lesson 2
- Probability tool: Gr 7 Topic 16 Lesson 3

PUZZLES AS A FORM OF PRACTICE

Puzzles can be used during the class work time in partners or groups and homework time individually. Some ideas include: jigsaw puzzles, riddles, matching flash cards, and board games.

Every on-level topic in the *digits* program includes a vocabulary puzzle in the topic review. The format of the puzzle varies, and some even have a mystery puzzle for students to solve after they match vocabulary terms with their appropriate descriptions. Drag and drop interactivity also adds a puzzle-like feel to several examples within the lessons themselves. In addition to adding fun to the lesson, the drag-and-drop style questions encourage engagement and discourse about an example.

- Gr 6 Topic 2 Topic Review
- Gr 6 Topic 7 Topic Review
- Gr 6 Topic 14 Topic Review
- Gr 6 Topic 16

HIGHER LEVEL MATHEMATICS

The mathematics we learn in elementary, middle, and high school is nothing like the mathematics that one learns in college. I remember being bored with math in middle and high school, because all we did was calculations. There is no reason why we cannot start laying a more solid foundation for set theory, abstract algebra, number theory and other topics at a younger age. The idea of modulo mathematics is not beyond a middle schooler, nor is the idea of a group. I actually think middle schoolers might have a lot of fun with basic concepts in game theory. Overall, I basically just think we stress the calculations far too much and the ideas behind them far too little.

The *digits* program is based on the mathematical content expectations as outlined in the Common Core Standards for Mathematics, so the sequence of lessons within a grade and the sequence of topics across the grade levels presents content appropriate for middle school students without the repetition that has been typical for middle grades programs.

- Gr 6 TOC
- Gr 7 TOC
- Gr 8 TOC

ANCHOR MATH CONCEPTS WITH A MEMORABLE FUNNY STORY

Effective teaching anchors concepts. The more solid the anchor, the longer the concepts are retained. Without solid grounding, concepts seem to float away over time. The simpler the foundation, the easier it is to build upon. Few of us recall details of classroom lectures from years ago. We may recall papers we authored, phrases that were repeated many times, or memorable classroom discussions. The only things I recall of several college chemistry courses are an experiment I designed to measure the amounts of caffeine in beverages and a nasty taste of some solution I that ended up in my mouth. Some stories seem permanently inscribed in my memory. The most memorable is a lively but humorous confrontation between a fellow student and a professor. Some lessons which I have relied on to solve problems through the years still available in my memory banks. The vast majority of classroom discussions seem to have wandered away. What anchors have worked for us? Can we study the anchors that have kept old lessons available to us? By studying those anchors, can we devise new and better anchors to offer today's students? What simple, intuitive explanations can we give to help students being introduced to Cartesian Coordinates?

Many topics in the *digits* program include characters that enhance the presentation of a problem or even add a bit of humor to a real-world context. Other characters, such as property hero, revisit topics across the grade levels as a visible reminder beyond the text that properties are an important part of mathematics and they link math content from one grade level to another.

- Gr 6 Topic 2: Property Hero
- Gr 7 Topic 13: Ms. Adventure
- Gr 8 Topic 4: Mad Maxx

Your Idea

How Was the Idea Implemented?

Where Does It Appear in digits?

INCORPORATING READING STRATEGIES

Why should reading strategies be incorporated into our math classrooms? Because we want our students to think and interact with the problems, not just generate answers that they somewhat understand. It is important to activate students' schema, so they can attach newly learned concepts to what they already know about the subject. During our math lessons, our students should be using writing to communicate their understanding. Quality not quantity! We need to steer away from assigning 40 math problems to assigning work that takes newly learned concepts and requires students to dig deeper and apply concepts to real world situations. After all, the new generation standards require our students to fully assimilate the concepts!

There are several elements within the *digits* program that foster reading, writing, and communicating about mathematics. For example, each Launch problem is designed for students to communicate about mathematics as they apply math skills they already have to solve a problem that links to the day's lesson. Many of the Launch problems ask students to 'Show How You Know' so that it's more than just a computation problem. Every Example and Got It provides an opportunity for students to discuss and write about the problem in addition to solving the problem. Many examples use graphic organizers such as Know-Need-Plan and Think-Write to foster reading and reasoning skills.

Every topic

- Gr 6 Topic 1 Lesson 3
- Gr 7 Topic 2 Lesson 3
- Gr 8 Topic 12 Lesson 1

POSITIVE AND NEGATIVE NUMBERS

We used oreo cookies. The positive numbers were the tops. The negative numbers were the creamy bottoms. We added them together by putting top on bottom to make whole cookies. You can eat or bag the whole cookies. The ones that are left are either positive or negative.

The digital tools within the *digits* program foster exploration for many of the middle grades concepts required of a Common Core program. They support the strands of the Common Core and include: pan balance, algebra tiles, integer chips, place value blocks, number lines, probability, 2-D and 3-D geometry, and graphing data.

- Pan balance tool: Gr 6 Topic 3 Lesson 2
- Coordinate grapher tool: Gr 6 Topic 4 Lesson 2
- Area models tool: Gr 6 Topic 5 Lesson 4
- Number line tool: Gr 6 Topic 8 Lesson 1
- 2-D Geometry tool: Gr 6 Topic 13 Lesson 3
- 3-D Geometry tool: Gr 6 Topic 14 Lesson 3
- Data and graphs tool: Gr 6 Topic 15 Lesson 2
- Integer Chip tool: Gr 7 Topic 4 Lesson 2
- Probability tool: Gr 7 Topic 16 Lesson 3

AREA, VOLUME

We took boxes and lined up small marshmallows in precise rows. The bottom of the box was area, and then we stacked the marshmallows until the box was full. The kids carefully remove the cube and multiply the number up, the number over and the number down. They then count the marshmallows to see if they got the answer.

The digital delivery environment for the *digits* program includes videos, animations, and other interactive tools to foster conceptual understanding as suggested in this idea. Cubes are stacked into a box to illustrate the concept of volume in the geometry lessons with that focus.

- Gr 6 Topic 14 Lesson 5
- Intervention Cluster 20 Lesson 5

MATHEMATICS EMBEDDED IN COMIC BOOK FORMAT

We have had some success in getting students talking about math by presenting concepts in a comic book format. We had a small grant to produce three comics with embedded mathematics that were used in the 4th-6th grade classes at a local elementary school. (The math concepts were aligned with NCTM standards for those grades, but the math and the idea could easily be adapted to 7th and 8th grade.) The teachers had the students read the character roles in the comics, and then they would pause and discuss when mathematics was used in the story. Search on "Operation Comics" if you are curious. The teachers using the comics found that the students loved using them, were never shy about reading them in class, and were better motivated to learn the concepts. A similar idea could be used in conjunction with the curriculum that is developed.

The *digits* program includes several characters to add humor and interest to the lessons being presented. Some examples include: Property Hero, Algo Rhythm, Data Girl, and Miss Adventures. In addition, every topic has a host character to convey important points about the topic and make observations about a problem.

- Gr 6 Topic 2: Property Hero
- Gr 7 Topic 13: Ms. Adventure
- Gr 8 Topic 4: Mad Maxx

Your Idea

How Was the Idea Implemented?

Where Does It Appear in *digits*?

READINGS

Calculations are important, but there is so much more to mathematics than just the finding the answer to an equation. I would love to see math students also reading, writing, and discussing mathematics. Perhaps an article on a recent math discovery summarizing the discovery and its importance, or an important historical discovery discussing the process leading to the discovery or the method used to find the discovery. Later, maybe the students can write or discuss about a concept they learned in class, its uses, how it works, etc. Another time, they are given a word problem that involves the use of recently learned concepts and they have to explain what they would do to solve it and why they are doing it. There can also be math projects where students have to do research outside of there book or do an experiment to learn more about a concept. Really anyone can plug numbers into a formula and spit out the answers, we need to place more importance on the why then we currently do!

There are several elements within the *digits* program that foster reading, writing, and communicating about mathematics. For example, each Launch problem is designed for students to communicate about mathematics as they apply math skills they already have to solve a problem that links to the day's lesson. Many of the Launch problems ask students to 'Show How You Know' so that it's more than just a computation problem. The Problem Solving Lessons in each topic require students to apply the concepts of the topic to problems that may draw not only from the concepts of the topic but previous topics within the grade level or even previous grade levels. Several lessons include problems that focus on error analysis, where students have to analyze the work presented in the problem, identify the error in reasoning, explain the error, and correct the error so that the solution is correct.

Every topic

- Gr 6 Topic 1
- Gr 7 Topic 2
- Gr 8 Topic 12

DISCOVERING PI

Explain that students will be learning about measuring circles and a mysterious number called "pi". Define the terms circumference, radius and diameter. Incorporate reading, measuring activities, and spreadsheets so that students look for patterns and see the relationship between circumference and diameter for a circle.

The *digits* program includes a topic on circles, and the program elements that support the topic include a variety of interactivity and engagement to bring a solid understanding of pi and the relationship to circumference, radius, and diameter.

Gr 7 Topic 11

USING GEOMETRY TO UNDERSTAND REAL-WORLD APPLICATIONS

I was going to be out for jury duty and wanted my kids to stay busy with math and not busy work so I went looking for projects and found an old one we used to use where our kids take a pre-test and that determines what tier they are in. They then get to build a poster, a comic strip or an advertisement. The kids LOVED it and I got A LOT of great projects out of it. I then went further and had them create a presentation about their project and present it to the class. This is a great way to help students understand and use geometry in the real world. Plus you get a lot of great things to hang around your room.

The Readiness test feature of the *digits* programs includes an individualized prescription for each student. This plan assigns activities that a student should complete based on their performance on the test. Students can work on their prescribed assignments at their own pace, as well as plan with their teacher on how best to work on the prescribed assignments. The enrichment activities also provide an opportunity for students to work on a unit-based problem, where the problem can be assigned at the start of a topic and worked on over several weeks.

Every Readiness Lesson

- Gr 6 Topic 13 Readiness Lesson
- Gr 7 Topic 11 Readiness Lesson
- Gr 8 Topic 9 Readiness Lesson

THINK PAIR SHARE

To get my students talking about math, I have students independently solve a problem, then pair up with a partner and share solution strategies. This gives every student a chance to talk through his or her mathematical thinking with a partner.

There are several elements within the *digits* program appropriate for group work opportunities. For example, each Launch problem can be done students working in pairs or larger groups. The Math Companion makes it very easy for students to work independently and then work with a partner.

Every topic

- Gr 6 Topic 1
- Gr 7 Topic 2
- Gr 8 Topic 12

TRANSFORMATIONS

To help visualize geometrical transformations, specifically rotations, I have students graph their original figure and then rotate the paper the appropriate number of degrees. This allows students to see where a figure will end up after certain rotations, rather than worrying about the coordinates.

The digital tools within the *digits* program foster exploration for many of the middle grades concepts required of a Common Core program. They support the strands of the Common Core and include: 2-D and 3-D geometry tools so that students can better understand the concept of transformations. The options within the tool allow teachers to choose whether or not to interact with a coordinate grid.

2-D Geometry tool: Gr 8 Topic 9 Lesson 4

Your Idea

How Was the Idea Implemented?

Where Does It Appear in *digits*?

AVAILABLE ANSWERS

My experience is that middle school students thrive on and benefit from immediate feedback. When I assign a worksheet in class, I will often put the answers on the whiteboard in a scattered array. Students are told that if they can find their answer on the board, they have the problem correct. Usually all the correct answers are there, but sometimes I throw in a couple "goof" answers based on the most logical errors I think my students will make. Students are very motivated to find out if they are right or not and they tend to power right through the worksheets without getting distracted or off topic.

There are several aspects within the *digits* program that promote instant feedback to students. Most critical to individual student work is homework. The online delivery of homework presents one problem at a time, and students are told immediately after submitting their answer whether or not their answer was correct. Every homework problem has support with tools and instructional aids, and because each homework problem is algorithmically driven, students can practice other problems like the initial one given for homework until they feel confident about their work. Every example in the *digits* program contains a worked-out solution linked directly to the problem, so students who may be working independently at home or outside of the classroom can try the problem and then compare their results to the presented solution. Many of the Launch and Example problems presented in the *digits* program include interactivity which displays the answers on the screen and students use techniques such as drag and drop to arrange or place the answer elements in the correct positions. Finally, most Got It problems that follow examples in each lesson can be presented to students in Open Response and Multiple Choice formats. So, if it helps students to see possible answer choices, they are provided as an option for a teacher to use during class as well as for students to use when working independently outside of class.

Every topic

- Gr 6 Topic 4 Lesson 4
- Gr 7 Topic 10 Lesson 3
- Gr 8 Topic 4 Lesson 4

STATIONS - AN EFFECTIVE STRATEGY FOR REACHING THE INDIVIDUAL NEEDS OF LEARNERS

At the beginning of the year, we organize students into groups of 4 where each person has a job: facilitator, materials, voice monitor, and encourager. We rotate around the room in groups of 8 to each station. The stations can vary and be anything from individual practice, small group work using technology, and lessons from the text with the teacher in a small group. By doing your stations in 15-30 intervals, the students keep their focus and they are able to receive much more individual help. After the first of the year, we choose 3 students to become whole group facilitators who rotate with their group around to each station where they have the opportunity to lead their group in pre-planned lessons that target different areas of need and focus on the standards they need to master. The teacher serves as a facilitator and floats around to each group stopping to make sure each group facilitator has what they need and to clarify any questions. These stations provide more engagement and learning than anything I have tried as a teacher, but it does require good planning and flexibility. It also allows for the students to exercise leadership skills that they so desperately need in the real world.

There are several elements within the *digits* program for group work opportunities. For example, each Launch problem can be done students working in pairs or larger groups. The Math Companion makes it very easy for students to work independently and then work with a partner. The Pull It All Together problems in the Topic Reviews encourage students to work together as they apply concepts from the current topic and other related concepts to solve more complex problems. The digital delivery allows a teacher to apply group techniques for any example within any lesson. Since every example is followed up with a Got It problem, it's very easy for a teacher to use a variety of instructional techniques to best meet the needs of his/her students.

Every topic

- Gr 6 Topic 4
- Gr 7 Topic 2
- Gr 8 Topic 12

SETTING THE STAGE FOR SYSTEMS OF EQUATIONS

Most of my students are familiar with cell phones, so I propose they figure out which of several competing companies plans would be best for them, before I begin any lessons. The students realize that they have a lot of tools, and are able to solve problems using math. As a class we discuss what they did. They use a lot of math techniques, making a table, graphing, advanced guess and check, algebraic manipulation, and they always figure out which plan is best for them. They don't consider this problem hard, because it is familiar to them. They often have a better understanding of why we are studying systems of equations.

The *digits* program includes a wide variety of real-world problems that are relevant to middle school students. Real world applications include cell phones and other areas both within the student immediate world and thinking about the bigger world.

- Gr 7 Topic 7 Readiness Lesson (cell phone plans)
- Gr 7 Topic 14 Readiness Lesson (endangered species)
- Gr 7 Topic 17 Readiness Lesson (games and probability)

Your Idea

VIDEO GAME COMPANY

A lot of students play video games, but do not understand the “business” behind the games. One way to teach about algebraic expressions is to use the context of a video game company. First, provide information about how much it costs to develop a game, how much it costs to manufacture the DVDs, and how much the DVDs will sell for. The students need to evaluate the information to determine how many DVDs need to be sold so that the company can make a profit.

How Was the Idea Implemented?

The *digits* program includes a wide variety of real-world problems that are relevant to middle school students. Real world applications include video games and other areas both within the student immediate world and thinking about the bigger world.

Where Does It Appear in *digits*?

- Gr 6 Topic 3 Readiness Lesson (video games)
- Gr 6 Topic 10 Readiness Lesson (music playlists)