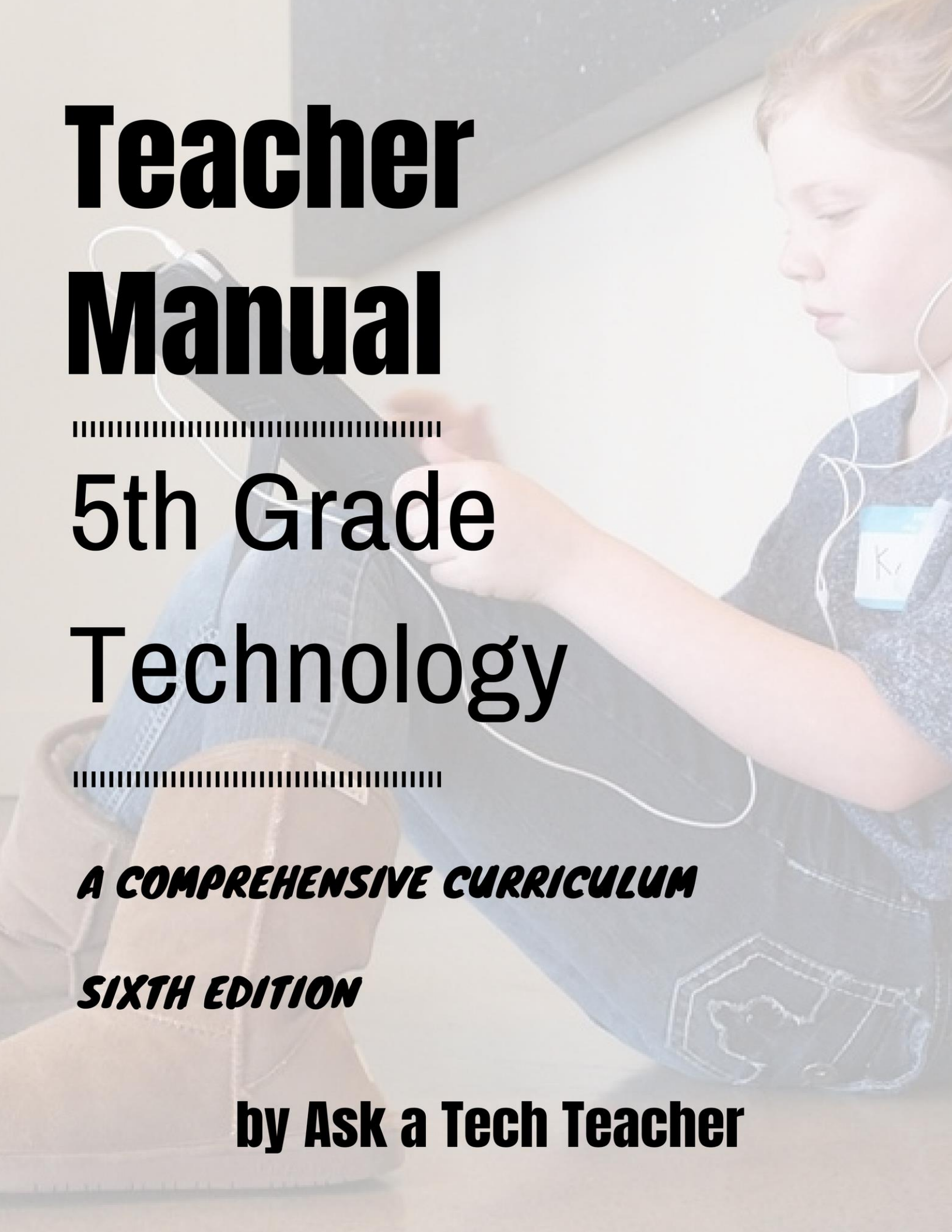

Teacher Manual

5th Grade Technology

A COMPREHENSIVE CURRICULUM

SIXTH EDITION

by Ask a Tech Teacher

FIFTH GRADE TECHNOLOGY

A COMPREHENSIVE CURRICULUM

Part Six of Nine of the SL Technology Curriculum

2024

Visit the companion website at Ask a Tech Teacher for more resources to teach technology

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Introduction

The educational paradigm has changed—again. Technology is now granular to learning, blended into standards from Kindergarten on, like these standards rephrased from Common Core:

- *Expect students to demonstrate sufficient command of **keyboarding** to type a minimum of one page [three by sixth grade] in a single sitting*
- *Expect students to **evaluate different media** [print or digital]*
- *Expect students to **gather relevant information** from print and digital sources*
- *Expect students to integrate and evaluate **information presented in diverse media** and formats*
- *Expect students to **interpret information** presented visually, orally, or quantitatively [such as interactive Web pages]*
- *Expect students to make **strategic use of digital media***
- *Expect students to use **glossaries or dictionaries, both print and digital** …*
- *Expect students to use information from **illustrations and words in print or digital** text*
- *Expect students to communicate with a **variety of media***
- *Expect students to **use text features and search tools** (e.g., key words, sidebars, **hyperlinks**) to locate information*

But how is this taught?

With the **Structured Learning Technology Curriculum**. Aligned with Common Core State Standards* and National Educational Technology Standards, and using a time-proven method honed in classrooms, students learn the technology that promotes literacy, critical thinking, problem-solving, and decision-making through project-based work. The purpose is not to teach step-by-step tech skills (like adding borders, formatting a document, and creating a blog). There are many fine books for that. What this curriculum does is guide you in providing the ***right information at the right time***.

Just as most children don't read at two or write at four, they shouldn't be required to place hands on home row in kindergarten or use the Internet before they understand the risks and responsibilities. The Structured Learning curriculum makes sure students get what they need at the right age with proper scaffolding. The end result is a phenomenal amount of learning in a short period of time.

"New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened their link to other forms of communication. Digital texts confront students with the potential for continually updated content and dynamically changing combinations of words, graphics, images, hyperlinks, and embedded video and audio."

—CCSS

"Use of technology differentiates for student learning styles by providing an alternative method of achieving conceptual understanding, procedural skill and fluency, and applying this knowledge to authentic circumstances."

—CCSS

If there are skills you don't know, visit our Help blog, Ask a Tech Teacher.com or visit the online companion resources at Structured Learning.net. It includes free videos to unpack each lesson, how-to's for curriculum skills, and more.

What's in the SL Technology Curriculum?

The SL Curriculum is project-based and collaborative, with wide-ranging opportunities for students to show their knowledge in the manner that fits their communication and learning style. Each grade level in the curriculum includes five topics that should be woven into 'most' 21st-century lesson plans:

- *keyboarding—more than typing*
- *digital citizenship—critical with Internet-based learning*
- *problem-solving—encourage critical thinking*
- *vocabulary—decode unknown words with technology*
- *publishing-sharing—to promote collaborative learning*

Here's a quick overview of what is included in the curriculum:

- *curated list of assessments and images*
- *articles that address tech pedagogy*
- *Certificate of Completion for students*
- *curriculum map of skills taught*
- *monthly homework (3rd-8th only)*
- *posters to visually represent topics*
- *Scope and Sequence of skills taught*
- *full lesson on keyboarding, digital citizenship and problem solving (at most grade levels)*
- *step-by-step weekly lessons*

Each weekly lesson includes:

- *assessment strategies*
- *class warm-up and exit ticket*
- *Common Core Standards*
- *differentiation strategies*
- *educational applications*
- *essential question and big idea*
- *examples, rubrics, images, printables*
- *ISTE Standards*
- *materials required*
- *pedagogic articles (if any)*
- *problem solving for lesson*
- *skills—new and scaffolded*
- *steps to accomplish goals*
- *suggestions to unpack*
- *suggestions based on digital device*
- *teacher preparation required*
- *time required to complete*
- *vocabulary used*
- *weekly how-to video (online)*
- *weekly real-time online question sessions*

Programs Used

Programs used in this curriculum focus on skills that serve the fullness of a student's educational career. Free alternatives are noted where available:

General		2-8	
Webtools	*Drawing program*	*Word processing tools*	*Desktop publisher*
Google Earth	*Image editor*	*Spreadsheet tools*	*Presentation tools*
	Keyboarding tool	*Email program*	

What's in the Sixth Edition?

In response to your requests, here are changes you'll find in the Sixth Edition:

- *You'll learn how to unpack lessons whether you're the **grade-level teacher or the tech teacher**.*
- *Lessons can be delivered on all **popular digital devices**.*
- *The importance of **higher order thinking**— analysis, evaluation, and synthesis—is called out**.***
- *The importance of '**habits of mind**' is included.*
- *Lessons note which **skills are scaffolded** from earlier lessons and which are new.*
- *Each lesson points out **academic applications** of technology.*
- *Students learn to **understand the process**, not just replicate a skill.*
- ***Collaboration and sharing** is often required.*
- *Teachers learn strategies to **meet students where they learn**.*
- *Each lesson includes a **warm-up and exit ticket**.*
- *A **Table of Images** and a **Table of Assessments** are included.*
- ***Scope and Sequence** includes CCSS references.*
- ***Curriculum Maps** shows which month topics are covered as well as which grade.*
- *Each grade-level curriculum includes **student workbooks** (sold separately).*
- *Each grade level has a **lesson on coding**.*

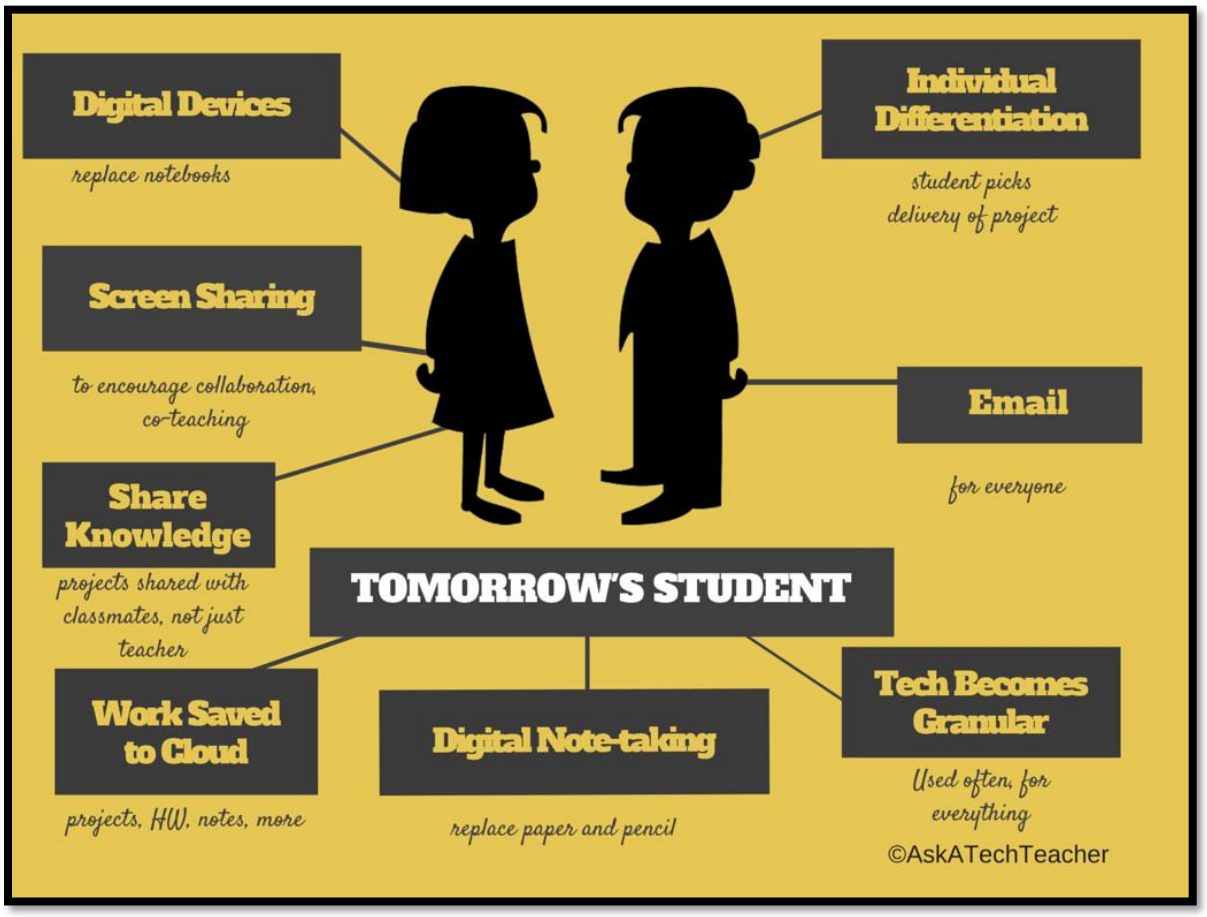
Who Needs This Book

You are the Tech Specialist, Coordinator for Instructional Technology, IT Coordinator, Technology Facilitator or Director, Curriculum Specialist, or tech teacher—tasked with finding the right project for a classroom. You have a limited budget, less software, and the drive to do it right no matter roadblocks.

Or you are the classroom teacher, a tech enthusiast with a goal this year—and this time you mean it—to integrate the wonders of technology into lessons. You've seen it work. Others in your PLN are doing it. And significantly, you want to comply with Common Core State Standards, ISTE, your state requirements, and/or IB guidelines that weave technology into the fabric of inquiry.

You are a homeschooler. Even though you're not comfortable with technology, you know your children must be. You are committed to providing the tools s/he needs to succeed. Just as important: Your child WANTS to learn with these tools!

Figure 1—Tomorrow's student



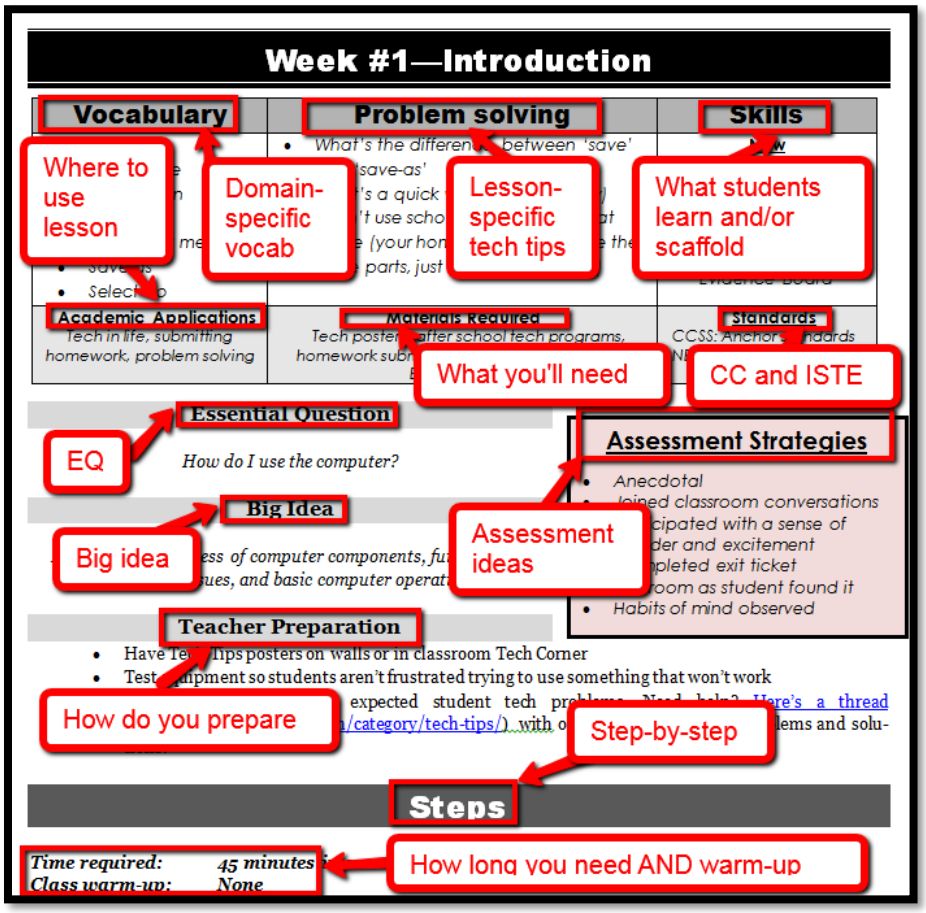
How do you reach your goal? With this curriculum. Teaching children to strategically and safely use technology is a vital part of being a functional member of society—and should be part of every school's curriculum. If not you (the teacher), who will do this? To build **Tomorrow's Student** (*Figure 1)* requires integration of technology and learning. We show you how.

How to Use This Book

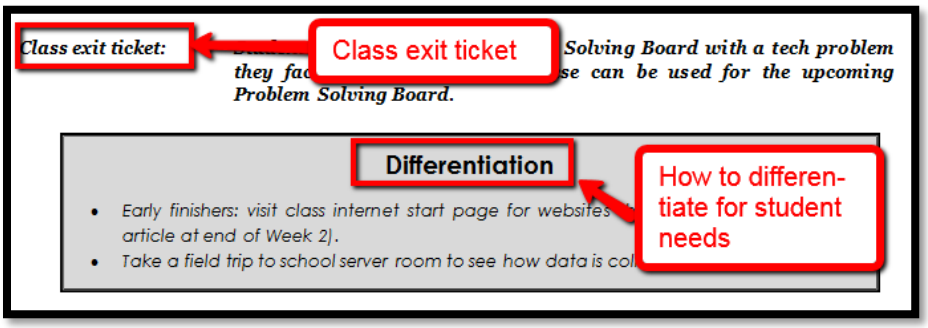
Figure 2a shows what's at the beginning of each lesson. *Figure 2b* shows what you'll find at the end:

- *Academic Applications*
- *Assessment Strategies*
- *Big Idea*
- *Class Warm-up*
- *Essential Question*
- *Material Required*
- *Problem solving*
- *Skills*
- *Standards*
- *Steps*
- *Teacher Prep*
- *Time Required*
- *Vocabulary*

Figure 2a-b—What's in each lesson?



- *Class differentiation strategies*
- *Class exit ticket*



The curriculum map in *Figure 3* shows what's covered in which grade. Where units are taught multiple years, teaching reflects increasingly less scaffolding and more student direction. If you're the grade-level teacher, here's how to use the map:

- Determine what skills were covered earlier years. Expect students to transfer that knowledge to this new school year.

- Review the topics and skills, but don't expect to teach.
- If there are skills listed as covered prior years, confirm that was done. If they weren't (for whatever reason), when you reach lessons that require the skills, plan extra time.

Figure 3—Curriculum Map—K-8

	Mouse Skills	Vocabulary - Hardware	Problem-solving	Platform	Keyboard	WP	Slide-shows	DTP	Spread-sheet	Google Earth	Search/ Research	Graphics/	Co-ding	WWW	Games	Dig Cit
K	☺	☺	☺	☺	☺					☺		☺	☺	☺		☺
1	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺		☺	☺	☺		☺
2		☺	☺	☺	☺	☺	☺	☺	☺	☺		☺	☺	☺		☺
3		☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺		☺
4		☺	☺		☺	☺	☺	☺	☺	☺	☺	☺	☺	☺		☺
5		☺	☺		☺	☺		☺	☺	☺	☺	☺	☺	☺		☺
6		☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺		☺
7		☺	☺	☺	☺	☺			☺	☺	☺	☺	☺	☺	☺	☺
8		☺	☺	☺	☺	☺			☺	☺	☺	☺	☺	☺	☺	☺

Figure 4 is a month-by-month curriculum map for this grade level. In the student workbook, students complete this themselves or as a group when they finish each lesson.

Figure 4—Curriculum Map—5th grade, month-to-month

	Sept *Wk1-4*	**Oct** *Wk5-8*	**Nov** *Wk9-12*	**Dec** *Wk13-16*	**Jan** *Wk17-20*	**Feb** *Wk21-24*	**March** *Wk25-28*	**Apr** *Wk29-32*
Blogs	x			x		x		
Class mgmt tools	x							
Coding		x						x
Collaboration						x	x	x
Communication	x							x
Computer etiquette	x							x
Critical thinking	x			x	x			x
DTP			x	x				x
Digital Citizenship	x							x
Google Earth						x		x
Graphics						x	x	x
Internet			x			x		x

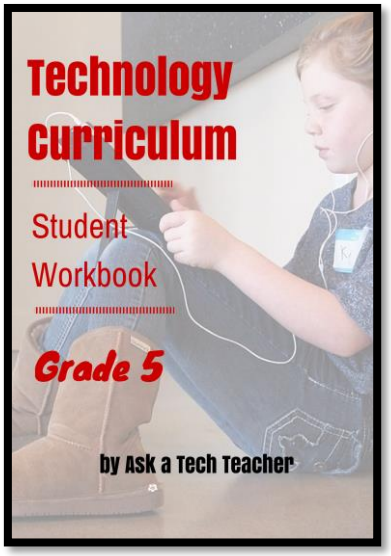
Internet privacy	x					x		x
Keyboarding	x	x				x		x
Presentations								x
Problem solving	x	x	x	x	x	x	x	x
Publishing/sharing	x							x
Research			x					x
Spreadsheets					x			x
Visual learning		x	x	x	x			x
Vocabulary	x	x	x	x	x	x	x	x
Webtools	x	x				x		x
Word Processing	x	x				x		x

Some topics are covered every month. The strategy: spiral and scaffold learning until it's habit.

If there is a skill students don't get, circle back on it, especially when you see it come up a second or third time through the course of the K-8 curricula. By the end of 8th grade, students have a well-rounded tech toolkit that serves their learning needs and prepares them for college and/or career.

Here are hints on using this curriculum:

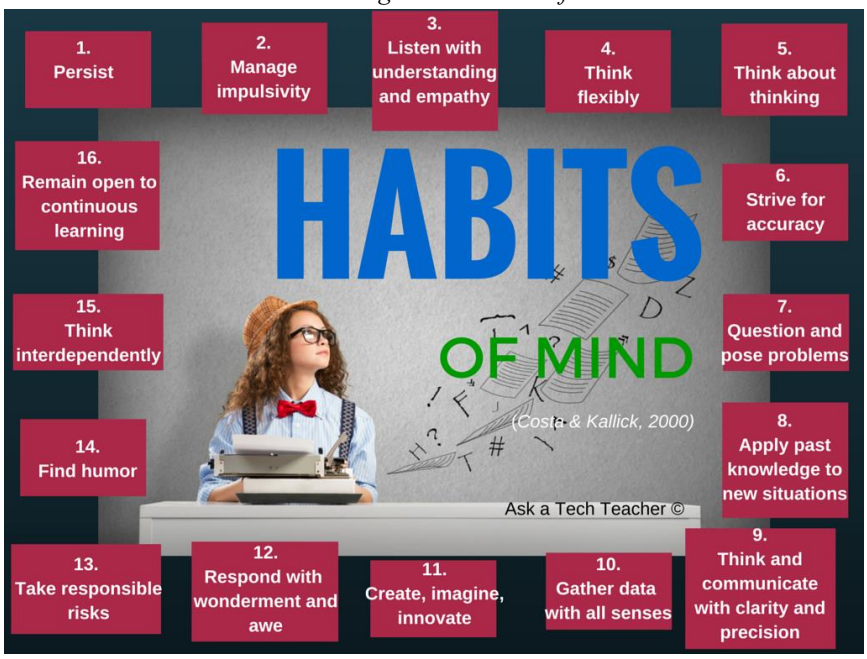
Figure 1--Student workbooks



- Get free curriculum-aligned resources at Ask A Tech Teacher or email askatechteacher at Gmail dot com with questions.
- Invest in student digital workbooks (sold separately), a companion to the teacher guide. Why?
    - *Projects are at student fingertips with full-color examples and directions (licensing varies depending on plan).*
    - *Workbooks can be viewed and annotated through a reader.*
    - *Students work at their own pace.*
- Once you've selected the program best for you, contact Zeke Rowe at structuredlearning.net for free start-up training.
- Teach lessons in the order presented in the book (grades K-5). They introduce, reinforce, and circle back on skills and concepts. Resist the urge to mix up lessons even if your perfect time for a particular project comes earlier/later than placement in the book. Some lessons can be taught any time during the year (like coding) or throughout the year (like keyboarding, digital citizenship, and problem solving).
- Don't expect to get through all lessons the first time you teach the curriculum. Lessons rely on scaffolded knowledge from prior years. Until students have built that foundation, they will move more slowly through activities. As students learn skills, expect more out of them.
- Personalize the skills taught in each lesson to your needs with 'Academic Applications'. These are suggestions for blending learning into your school curriculum.

- Most lessons start with a warm-up to get students back into tech and give you time to finish up a previous class. This is especially useful to the tech teacher and the LMS. Most lessons end with an Exit Ticket to wrap up learning.
- Some lessons offer several activities that will meet goals outlined in the Essential Question and Big Idea. Pick the activity (or activities) that work well for your student group. Alternatively, you can let students pick the one they like best.
- 'Teacher Preparation' often includes chatting with the grade-level team. Why?
    - *tie tech into their inquiry*
    - *offer websites for early-finishers that address their topics*
- Check off completed items on the line preceding the activity so you know what to get back to when you have time. If you have the ebook, use iAnnotate, Notable (Google for websites), or another annotation tool that works for your devices.
- The curriculum expects students to develop 'habits of mind'. Read more about Art Costa and Bena Kallick's discussion of these principles in *Figure* 6, and the article at the end of Lesson #1. In a sentence: Habits of Mind ask students to engage in their learning, not simply memorize.

Figure 6—Habits of Mind



- Sometimes the class is too excited about what they're learning to move on. Take an extra week. Most schools run 35-40 weeks. This book includes 32 lessons.
- Expect students to be risk takers. Don't rush to solve their problems. Ask them to think how it was done in the past. Focus on problems listed in the lesson, but embrace all that come your way. This scaffolds critical thinking and troubleshooting when you won't be there to help.
- Expect students to direct their own learning. You are a 'guide on the side', a facilitator not lecturer. Learning is accomplished by both success and failure. Don't expect free time while students work. Move among them to provide assistance, and observations on their keyboarding, problem-solving, and vocabulary decoding skills.

- Encourage student-directed differentiation. If the Big Idea and Essential Question can be accommodated in other ways, embrace those.
- If you need resources on specific topics, check Ask a Tech Teacher's resource pages.
- Always use lesson vocabulary. Students gain authentic understanding by your example.
- Look for these icons:


indicates video


indicates work with a partner

indicates an article

indicates a poster (in Appendix)


indicates material in workbooks

- Use as much technology as possible in your classroom—authentically and agilely--whether it's a smartphone timing a quiz, a video of activities posted to the class website, or an audio file with student input. If you treat tech as a tool in daily activities, so will students.
- **If you have the digital book, zoom in on posters, rubrics, lessons to enlarge as needed.**
- Every effort has been made to accommodate digital devices. If the activity is impossible in a particular digital device (i.e., iPads don't have mouses; software doesn't run in Chromebooks), focus on the **Big Idea and Essential Question**—the skill taught and its application to inquiry. Adapt instructions to the tool you use as you work through the steps.

Figure 7—Compatible digital devices

A desktop PC, iMac, laptop, MacBook, Chromebook, iPad, or smartphone

- Throughout the year, circle back on concepts. It takes five times to get a skill (*Figure 8*)—
  - ***First***: *They barely hear you*
  - ***Second***: *They try it*
  - ***Third***: *They remember it*
  - ***Fourth***: *They use it outside of class*
  - ***Fifth***: *They tell a friend*

Typical Lesson

Each lesson requires about 45 minutes a week, either in one sitting or spread throughout the week, and can be unpacked:

- *In the grade-level classroom*
- *In the school's tech lab*

Figure 2--It takes 5 times...

In general terms, here's how to run a lesson in **the tech lab**:

- Post a **written schedule** for the day on the class screen:
    - *Warm up*
    - *Main activity*
    - *Exit ticket*

  This gives students a visual guideline. Add it to your class blog or website to serve those students who aren't present. Expect students to start with the warm-up when they arrive to class.
- **Warm up about 10 minutes,** often with typing practice.
- Complete student **Board presentations** (grades 3-8).
- If it's the end of a grading period, review skills accomplished with **Scope and Sequence**.
- If starting a **new project, review it**. If in the middle of one, use the balance of class to work towards completion. Monitor, answer questions, and help as needed.
- As often as possible, give **younger students two weeks** to finish a project—one to practice, one to save/export/share/print. This redundancy reinforces new skills and mitigates stress. If it's week two, start with the project and finish with typing so students have ample time to work.
- List age-appropriate websites on class Internet start page that **tie into inquiry** for students who complete the current project. Students know these websites can be used during free time.
- **Class exit ticket** might include lining up in arrays, answering a poll posted on the class screen, or simply have classmates verify that neighbors left their stations as they found it.
- **Use tech wherever possible.** Model what you ask of them.

Here's how to run the lesson in **the grade-level classroom**:

- Take the lesson pieces mentioned above and scatter them throughout the week. For example:
    - ***3-10 minutes for the class warm-up—****at the start of the week*
    - ***10-15 minutes keyboarding practice—****any day*
    - ***10-15 minutes Board presentations—****any day*
    - ***15-35 minutes for the project—****any day*
    - ***2-3 minutes for class exit ticket****—to reinforce learning*

- **Check off accomplished activities** so you know what remains each week.

Here are useful pieces to extend this curriculum, available from Structured Learning:

- *Student workbooks—allow students to be self-paced*
- *Digital Citizenship curriculum— if this is a school focus (sold separately)*
- *Keyboarding Curriculum— if this is a school focus (sold separately)*

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About the Authors

Ask a Tech Teacher *is a group of technology teachers who run an award-winning resource blog. Here they provide free materials, advice, lesson plans, pedagogical conversation, website reviews, and more to all who drop by. The free newsletters and articles help thousands of teachers, homeschoolers, and those serious about finding the best way to maneuver the minefields of technology in education.*

Table of Contents

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K-5 TECHNOLOGY SCOPE AND SEQUENCE©

Aligned with ISTE (International Society for Technology in Education) and Common Core State Standards
Check each skill off with I (Introduced), W (Working on), or M (Mastered)

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Lesson #1 Introduction

Vocabulary	Problem solving	Skills
• *Back-up* • *Landscape* • *Orientation* • *Portrait* • *Right-click menu* • *Save-as* • *Select-do*	• *What's the difference between 'save' and 'save-as'* • *What's a quick way to ** (shortkey)* • *I don't use school email program at home (your home version will have the same parts, just in different places)* • *I have lots of problems (check PS board)*	**New** *Class rules* *Some posters* **Scaffolded** *Problem solving* *Evidence Board*
Academic Applications *Tech in life, submitting homework, problem solving*	**Materials Required** *posters, after school tech, homework submittal, class rules, Evidence Board, student workbooks (if using)*	**Standards** *CCSS: Anchor standards* *NETS: 1a, 1b*

Essential Question

How do I use technology?

Big Idea

Develop an awareness of components, fundamental hardware issues, and basic operations of school digital device

Teacher Preparation

- Have Tech Tips posters on walls or in class Tech Corner.
- Test equipment so students aren't frustrated trying to use something that won't work.
- Know how to fix expected student tech problems.

Assessment Strategies

- *Anecdotal observation*
- *[tried to] solve own problems*
- *Used good keyboarding habits*
- *Decisions followed class rules*
- *Joined classroom conversations*
- *Participated with a sense of wonder*
- *Completed exit ticket*
- *Left room as student found it*
- *Habits of Mind observed*
- *Engaged in higher order thinking*

Steps

Time required: ***45 minutes in one sitting or spread throughout the week***
Class warm-up: ***None***

_____Before anything else, explain to students what your expectations are for their time with you—what's the ***21st Century Lesson Plan*** (article at end of lesson).

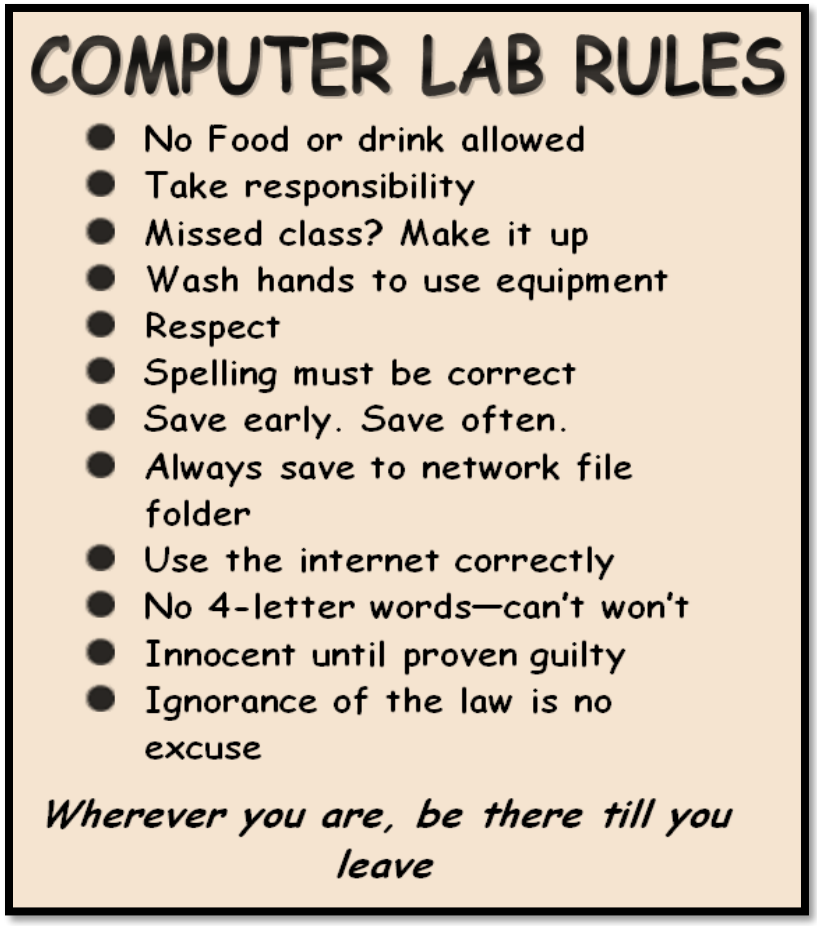
_____Tour classroom. Show students tech. Review important posters, i.e., difference between 'backspace' and 'delete', Mulligan Rule, portrait and landscape, and 'select-do'. See full size examples in Appendix.

_____Collect rules from students to guide class actions, including:

- *No excuses; don't blame others; don't blame the computer.*
- *No food or drink around the computer. Period. Exclamation point!*
- *Respect the work of others and yourself.*
- *Keep hands to yourself. Feel free to help neighbors, but with words only.*
- *Try before asking for help.*

_____You may start with a list like *Figure 9*, from the prior year, and get student thoughts on updating, amending, and revising.

Figure 9—Technology rules



_____If using workbooks, students can handwrite their suggested rules into the PDF.

_____Make sure this list includes class discussion guidelines such as 1) listening to others, 2) taking turns while speaking, and 3) waiting to be called on before speaking.

_____Let students know that you are open to alternative suggestions on tools to use for a class project. For example, if you suggest Wordle, a student can request Tagxedo. Approval will be granted if the tool fulfills class guidelines. Expect them to use **evidence** to build their case, **compare-contrast** their tool to your suggestions, and **draw logical conclusions**.

_____Offer a **Keyboarding Club** after school two days a week to accommodate students who can't do their homework at home. Limit it to 45 minutes.

_____Offer after-school help on those days for students who need assistance with a tech skill or a project involving tech. Request student volunteers who will assist classmates. You may collaborate with your school's STAR program, where students volunteer for activities as part of class requirements.

_____Review homework policy (homework in the back of this text): due at the end of each month. Students may submit homework via email, a dropbox, or Google Apps (discussed in next unit).

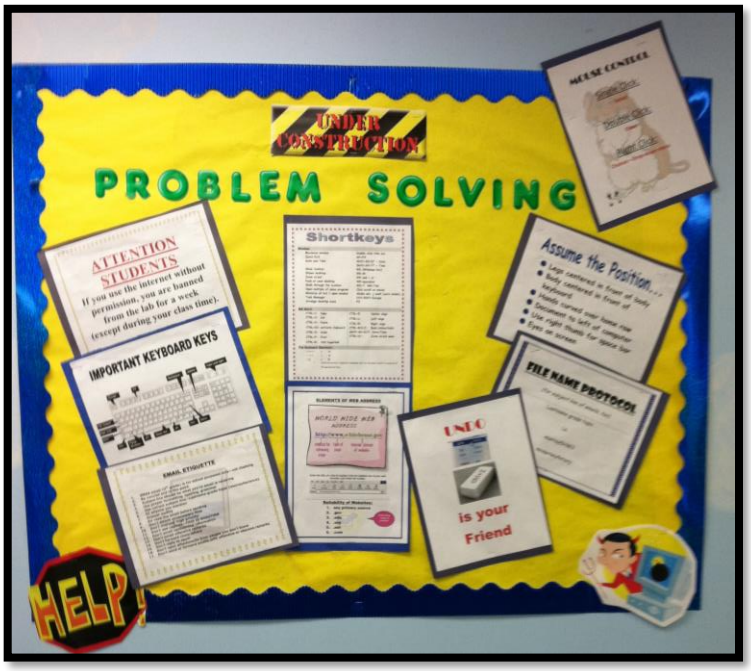
_____Discuss the evidence board (*Figures 10a* and *10b*):

Figure 10a—Evidence Board; 10b—Badge

_____This is a bulletin board that celebrates student transfer of knowledge from tech class to home, friends, or other educational endeavors. About once a month, students will have an opportunity to share how they use tech skills in other classes, at home, or with friends. They will fill out a badge (like *Figure 10b*) and post it on the Evidence Board by their class. By the end of the year, you want this collection to encircle the classroom.

_____Review Problem Solving corner of classroom—a bulletin board where you collect common tech problems students will be expected to solve wherever they use computers (see *Figure 11*). More on this in the Problem-solving lesson.

Figure 11—Problem-solving Board



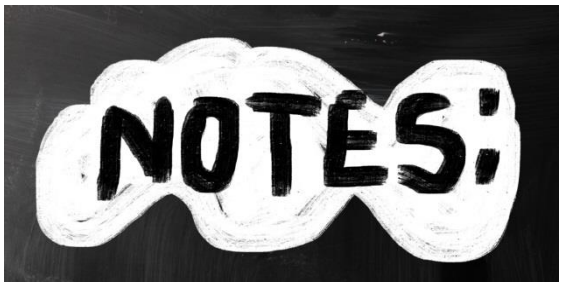
_____Throughout class, check for understanding.

Class exit ticket: ***Students tack a post-it on Problem-solving Board with a tech problem they faced in the last week. These can be used for the upcoming***

Problem-solving Board.

Differentiation

- *Early finishers: visit class internet start page for websites that tie into classwork (see article at end of Lesson 2).*
- *For more, read **"Class Warm-ups and Exit Tickets"** at the end of the lesson.*
- *For more on how to build a lesson, read **"4 Things Every Teacher Must Teach"** at end of lesson.*
- *Take a field trip to school server room to see how data is collected and curated.*



Article 1—What is the 21st Century Lesson Plan

What is the 21st Century Lesson Plan?

Technology and the connected world put a fork in the old model of teaching—teacher in front of the class, sage on the stage, students madly taking notes, textbooks opened to a particular chapter being reviewed, homework as worksheets based on the text, tests regurgitating important facts. Did I miss anything? This model is outdated **not because it didn't work** (many statistics show students ranked higher on global testing years ago than they do now), **but because the environment changed.** Our classrooms are more diverse. Students are digital natives, already in the habit of learning via technology. The 'college and career' students are preparing for is different so the education model must be different.

Preparing for this new environment requires radical changes in teacher lesson plans. Here are seventeen concepts you'll want to include in your preparation:

1. Students are graduating from high school unable to work in the jobs that are available. It's the teacher's responsibility to insure students **learn over-arching concepts** such as how to speak to a group, how to listen effectively, how to think critically, and how to solve problems. The vehicle for teaching these ideas is history, science, literature, but they aren't the goal.
2. To focus on the over-arching concepts above, make earning **platform-neutral**. For example, when teaching spreadsheets, make the software or online tools a vehicle for practicing critical thinking, data analysis, and evidence-based learning, not for learning one brand of software or a particular spreadsheet tool. Besides, what you use at school may not be what students have at home. You don't want students to conflate your lessons with 'something done at school'. You want them to apply them to their life.
3. **Morph the purpose from 'knowing' to 'understanding'**. Teach the process, not a skill. Students should understand why they select a particular tool, not just how to use it. Why use PowerPoint instead of a word processing program? Or a spreadsheet instead of a slideshow? Expect students to be critical thinkers, not passive learners.
4. **Transfer of knowledge is critical.** What students learn in one class is applied to all classes (where relevant). For example, *word study* is no longer about memorizing vocabulary, but knowing how to decode unknown academic and domain-specific words using affixes, roots, and context.
5. **Collaboration and sharing** is part of what students learn. They help each other by reviewing and commenting on projects before submittal to the teacher (Google Apps makes that easy). The definition of 'project' itself has changed from 'shiny perfect student work' to *review-edit-rewrite-submit*. You grade them on all four steps, not just the last one. This makes a lot of sense—who gets it right the first time? I rewrote this article at least three times before submitting. Why expect differently from students? **Plus:** No longer do students submit a project that only the teacher sees (and then a few are posted on classroom bulletin boards). Now, it is shared with all classmates, so all benefit from every student's work.

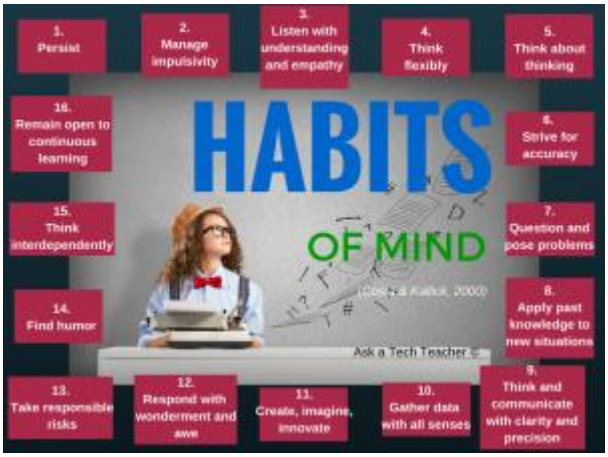
6. **Self-help methods** are provided and you expect students to use them. This includes online dictionaries and thesauruses, how-to videos, and access to teacher assistance outside of class. These are available 24/7 for students, not just during classroom hours. This happens via online videos, taped class sessions, the class website, and downloadable materials so students don't worry that they 'left it in their desk'.
7. **Teachers are transparent** with parents. You let them know what's going on in the classroom, welcome their questions and visits, communicate often via email or blogs when it's convenient for them. That doesn't mean you're on duty around the clock. It means you differentiate for the needs of your parents. Your Admin understands that change by providing extended lunch hours, compensatory time off, or subs when you're fulfilling this responsibility.
8. **Failure is a learning tool.** Assessments aren't about 'getting everything right' but about making progress toward the goal of preparing for life
9. **Differentiation is the norm.** You allow different approaches as long as students achieve the Big Idea or answer the Essential Question. You aren't the only one to come up with these varied approaches—students know what works best for their learning and present it to you as an option.
10. The **textbook is a resource**, supplemented by a panoply of books, primary documents, online sites, experts, Skype chats, and anything else that supports the topic. This information doesn't always agree on a conclusion. Students use habits of mind like critical thinking, deep learning, and evidence-based decisions to decide on the right answers.
11. The **lesson plan changes from the first day to the last**—and that's OK. It is adapted to student needs, interests, and hurdles that arise as it unfolds, while staying true to its essential question and big idea.
12. **Assessment** might include a quiz or test, but it also judges the student's transfer of knowledge from other classes, their tenacity in digging into the topic, their participation in classroom discussions, and more.
13. **Vocabulary is integrated into lessons,** not a stand-alone topic. Students are expected to decode words in class materials that they don't understand by using quickly-accessed online vocabulary tools, or deriving meaning from affixes, roots, and context.
14. **Problem solving is integral** to learning. It's not a stressful event, rather viewed as a life skill. Who doesn't have problems every day that must be solved? Students are expected to attempt a solution using tools at their disposal (such as prior knowledge, classmates, and classroom resources) before asking for help.
15. **Digital citizenship is taught,** modeled and enforced in every lesson, every day, and every classroom. It's no longer something covered in the 'tech lab' because every class has as much potential for working online as offline. Every time the lesson plan calls for an online tool or research using a search engine or a YouTube video, teacher's review/remind/teach how to visit the online neighborhood safely. It's frightening how students blithely follow weblinks to places most parents wouldn't allow their child to visit in their neighborhood. Just as students have learned how to survive in a physical community of strangers, they must learn to do the same in a digital neighborhood.

16. **Keyboarding skills are granular.** They aren't used only in the computer lab, but in every class students take. If students are using iPads, Chromebooks, laptops, or desktops for learning, they are using keyboarding—which means they must know how to do so efficiently, quickly, and stresslessly. Since keyboarding benefits all classes, all teachers–including the librarian–become partners in this effort. I go into classrooms and show students the broad strokes; the teacher reinforces it every time the student sits down at the computer.
17. **Play is the new teaching.** It is a well-accepted concept for preschoolers and has made a successful leap to the classroom, relabeled as 'gamification'. Use the power of games to draw students into learning and encourage them to build on their own interests. Popular games in the classroom include Minecraft, Mission US, Scratch, and others. If your school is new to this concept, clear it with admin first and be prepared to support your case.

When I first wrote lesson plans, it was all about aligning learning with standards, completing the school's curricula, ticking off required skills. Now, I must build the habits of mind that allow for success in education and home life and construct a personal knowledge base with students that will work for their differentiated needs. Like any lesson plan, this is only difficult the first time. After that, it seems natural.

Article 2—Habits of Mind vs. CC vs. IB

Habits of Mind vs. Common core vs. IB



Pedagogic experts have spent an enormous amount of time attempting to unravel the definition of 'educated'. It used to be the 3 R's—reading, writing, and 'rithmetic. The problem with that metric is that, in the fullness of time, those who excelled in the three areas weren't necessarily the ones who succeeded. As long ago as the early 1900's, Teddy Roosevelt warned:

""C students rule the world."

It's the kids without their nose in a book that notice the world around them, make connections, and learn natively. They excel at activities that aren't the result of a GPA and an Ivy League college. Their motivation is often failure, and taking the wrong path again and again. As Thomas Edison said:

""I have not failed. I've just found 10,000 ways that won't work."

Microsoft founder, Bill Gates, and Albert Einstein are poster children for that approach. Both became change agents in their fields despite following a non-traditional path.

In the face of mounting evidence, education experts accepted a prescriptive fact: student success is not measured by milestones like 'took a foreign language in fifth grade' or 'passed Algebra in high school' but by how s/he thinks. One curated list of cerebral skills that has become an education buzz word is Arthur L. Costa and Bena Kallick's list of sixteen what they call Habits of Mind (Copyright ©2000):

1. *Persisting*
2. *Managing impulsivity*
3. *Listening with Understanding and Empathy*
4. *Thinking Flexibly*
5. *Thinking about Thinking*
6. *Striving for Accuracy*
7. *Questioning and Posing Problems*
8. *Applying Past Knowledge to New Situations*
9. *Thinking and Communicating with Clarity and Precision*
10. *Gathering Data through All Senses*
11. *Creating, Imagining, Innovating*
12. *Responding with Wonderment and Awe*
13. *Taking Responsible Risks*
14. *Finding Humor*
15. *Thinking Interdependently*
16. *Remaining Open to Continuous Learning*

Together, these promote strategic reasoning, insightfulness, perseverance, creativity and craftsmanship.

But they're not new. They share the same goals with at least three other widely-used education systems: 1) Common Core (as close as America gets to national standards), 2) the International Baccalaureate (IB) program (a well-regarded international curriculum, much more popular outside the US than within), and 3) good ol' common sense. Below, I've listed each Habit of Mind with a brief explanation of what that means (in italics). I then point out connections to Common Core, the IB Program, and the common sense your grandma shared with you. The result is a compelling argument that education is less a data download and more a fitness program for our brains.

Persisting

Stick with a problem, even when it's difficult and seems hopeless.

Winston Churchill said, "Never, never, in nothing great or small, large or petty, never give in..." The same decade, Albert Einstein said:

"It's not that I'm so smart, it's just that I stay with problems longer."

The Common Core is not a curriculum, rather a collection of forty-one overarching Standards in reading, writing, language, math, and speaking/listening that shape a student's quest for college and career. Sprinkled throughout are fundamental traits that go beyond the 3R's and delve deeply into the ability of a student to think. The math standards require students learn to 'persevere in solving problems'.

The IB Program has twelve attitudes that are fundamental to every learner: *appreciation, empathy, commitment, enthusiasm, confidence, independence, cooperation, integrity, creativity, respect, curiosity, and tolerance.* Students exhibiting the attitude of commitment persist in their own learning, persevere no matter the difficulties.

Managing Impulsivity

Consider options. Think before speaking.

Among his endless words of wisdom, Benjamin Franklin said:

"It is easier to suppress the first desire than to satisfy all that follow it."

Common Core Standards tell us to 'Use appropriate tools strategically'.

Besides the twelve attitudes listed above, the IB Program names ten traits that profile a learner: *inquirer, knowledgeable, thinker, communicator, principle, open-minded, caring, a risk-taker, balanced, and reflective.* Students who are reflective give thoughtful consideration before acting.

For the rest of the article, search the title on Ask a Tech Teacher

Class Warm-ups and Exit Tickets

Warm-ups are given at the beginning of class to measure what students remember from prior lessons or know about a subject before jumping into a unit. They inform teachers how to optimize time by teaching what students need to learn, not wasting time on what students already know. They are a couple of minutes, can be delivered via a Discussion Board, blog comments, a Google Form, or many other methods. Exit tickets are similar, but assess what students learned **during** the lesson. In this way, teachers know if they should review material, find a different approach to teaching a topic, or students are ready to move on. Like Warm-ups, Exit tickets are a few minutes, and delivered in a wide variety of creative methods.

Here are a few examples:

Polls

Polls are quick ways to assess student understanding of the goal of your daily teaching. It measures student learning as much as lesson effectiveness. Polls are fast—three-five minutes—are anonymously graded and shared immediately with students. It lets everyone know if the big idea of the lesson is understood and if the essential questions have been answered.

These can be graded, but are usually used formatively, to determine organic class knowledge before moving on to other topics.

Tools: Socrative, PollDaddy, Google Forms
Time: a few minutes
Method: Formative assessment

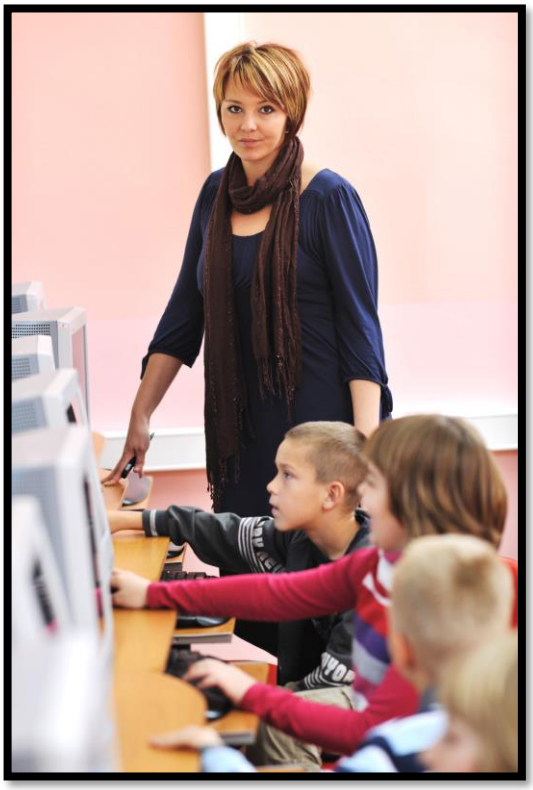
Virtual Wall

Ask students a question and have them add their answer to a virtual wall.

Virtual walls are also great ideas for reviewing a subject prior to a summative assessment. Have each student post an important idea they got from the unit with significant required details.

Tools: Padlet, Linoit
Time: a few minutes
Method: Formative assessment

4 Things Every Teacher Must Teach and How



Teaching technology is not sharing a new subject, like Spanish or math. It's exploring an education tool, knowing how to use computers, IPads, the Internet, and other digital devices to serve learning goals. Sure, there are classes that teach MS Word and C++, but for most schools, technology is employed strategically and capably to achieve all colors of education.

Which gets me to the four subjects every teacher must teach, whether s/he's a math teacher, science, literacy, or technology. In today's education world, all of us teach—

- *vocabulary*
- *keyboarding*
- *digital citizenship*
- *research*

They used to be taught in isolation—*Fridays at 8:20, we learn vocabulary*—but not anymore. Now they must be blended into all subjects like ingredients in a cake, the result—college or career for the 21st century student. Four subjects that must be taught—and thanks to technology, CAN be with ease. Let me explain.

Vocabulary

Common Core requires that:

Students constantly build the transferable vocabulary they need to access grade level complex texts. This can be done effectively by spiraling like content in increasingly complex texts.

Does that sound difficult? Think back to how you conquered vocabulary. As an adult, you rarely meet words you can't understand—unless you're chatting with William F. Buckley—and if you do, you decode it by analyzing prefixes, suffixes, roots, context. Failing that, e-dictionaries are available on all digital devices.

Teach your students to do the same:

- first: try to decode the word using affixes, root, context
- second: research meaning

You might think that will grind the academic process to a halt, but truth, in age-appropriate texts, there are likely less than five unknown words per page. What you don't want to do is have students write

down words for later investigation. That becomes a chore, cerebral excitement leeched like heat to a night desert sky. Much better to stop, decode, and move on.

As students work on a project in my classes, I see neighbors ask for help with a mysterious word (students are welcome to chat during class about academic topics), screens light up as students use the online dictionary to discover meaning, and words appear on the class screen as part of the backchannel X/Twitter stream. Seconds later, a definition will appear—someone's contribution. If it's wrong, invariably a student will correct it. Rarely, I jump in.

Don't believe this works? Try it out.

Keyboarding

For years, I taught keyboarding as a separate activity. We warmed up class with 10-15 minutes of keyboarding augmented by 45 minutes a week of keyboard homework. I've revised my thinking. Since keyboarding benefits all classes, I make all teachers—including the librarian—my partners in this effort. I go into classrooms and show students the broad strokes of keyboarding posture, good habits, skills that will enable them to type fast and accurately enough to eventually—maybe third or fourth grade—use the keyboard without slowing down their thinking. That's a big deal and worth repeating—

To be organic, students must be able to keyboard without thinking of their fingers, fast enough that they keep up with their thoughts.

That's about 25 words per minute. *Really?* Yes really. Sure, we think fast, but ruminating over a class question, essay, report is much [much] slower. 25-35 words per minute suffice.

I start students with mouse and keyboard familiarity in kindergarten and 1st grade, introduce the concept of hands and fingers in 2nd, and start speed and accuracy in 3rd. By 5th grade, they're good. This works because now, keyboarding is integrated across all classes, anytime students use a digital device with a keyboard. Now, all teachers pay as much attention to HOW students use the keyboard as WHAT is produced, focusing on:

- good posture
- hands on home row (by 3rd grade)
- elbows at sides
- paper (if using one) to the side of keyboard
- eyes on screen (by 4th grade)
- no flying fingers or hands
- paced rhythm

Parents, too, are my partners. I communicate the same requirements to them with the hope they'll reinforce these at home. A reminder that assessments are often online gets their attention.

Digital Citizenship

It's frightening how much time students spend in an online world they consider safe, following links like blind streets to places most parent wouldn't take their child. Just as students have learned how to survive in a physical community of strangers, they must now learn to do the same in a digital neighborhood. Parents and teachers can't be everywhere, and hiding children from danger doesn't teach them survival skills, so we must teach them how to live in this wild new online world.

Likely, most kindergartners arrive to your classroom familiar with parent smartphones and IPad apps. That means, you start by discussing the 'digital neighborhood', 'stranger danger', 'personal privacy'. Do this every time students use the Internet. Sure, it'll take longer to get to Starfall Math, but students must know the right way to use online sites. Like with keyboarding, make other teachers and parents partners. Let them know what you've taught about digital citizenship and ask them to reinforce it.

Here's the hard part: You must be diligent. Until safe Internet use becomes a habit, you must discuss it every time students cross the threshold of the World Wide Web. There are endless resources—use all of them. Eventually, Internet use will be a safe place to access the innumerable volumes of wonderful resources.

Research

Expect students to use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information)

I added 'Research' as a fourth blended topic in response to the wealth of misinformation that bombards us daily. It used to be students learned from a trusted textbook that had been vetted and approved over time. Now, textbooks have been replaced with a panoply of books, online sites, experts, Skype chats whose information doesn't always agree. How are students to choose between the opinions of their parents or an astrophysicist who Skyped with the class?

No room for uninformed choosing. Students must research—find truthful, valid information about topics that concern them.

Introduce this concept with a discussion on government. American Democracy thrives on the loud and often messy sharing of diverse opinions. That is to be applauded, not stamped out. But with the demise of trustworthy news interpreters (like the Evening News with Walter Cronkite taken as fact by tens of thousands every evening) comes the rise of primary sources. Thanks to the Internet, finding original documents is doable. Ask students to read, interpret, and share their evidence-based thoughts. No one's right or wrong. We're merely investigating how many shades of 'truth' there are.

There you have it. Four topics that must be included in every lesson. If you covered nothing else but these, you'd have a good year.

Intentionally deleted

Lesson #5 Organizing Ideas

Vocabulary	Problem solving	Skills
• *Alignment* • *Bullets* • *Citations* • *Heading* • *Icons* • *Indent/exdent* • *Monitor* • *Mulligan* • *Outline* • *Shift+tab* • *Title*	• *What is today's date (check clock in lower right corner or use shortkey)* • *I can't find my word processing program (if it's software, use Search field)* • *I got out of outline (backspace to the last bullet and push enter)* • *What's the difference between a heading and a title?* • *Can't get outline to work (try shortkeys)* • *Computer crashed (save early save often)*	**New** *Brainstorming* *Mindmapping* **Scaffolded** *Outlining* *Keyboarding* *Speaking/listening* *Digital citizenship*
Academic Applications *Writing, research, history, literacy, math, any class to organize thoughts, ideas, research*	**Materials Required** *textbook and notes, word processing program, graded hardware quizzes, Important Keys quiz, Problem Solving Board sign-up, Evidence Board badges, student workbooks (if using)*	**Standards:** *CCSS: W.5.5* *NETS: 3c, 4b, 5c*

Essential Question

How do I organize information more efficiently?

Big Idea

Organizing information precedes analysis and reflection

Teacher Preparation

- Know which tasks weren't completed last week.
- Graded hardware tests.
- Have Important Keys quiz (or link to file).
- Talk with grade-level team so you tie into inquiry.
- Collect words to include in Speak Like a Geek Board.
- Know if you need extra time to complete this lesson.
- Verify all required links are available.
- Integrate tech vocabulary into lesson.
- Ask grade-level team and parents if there are any tech problems students need help with.
- Remind students to bring a science/history/etc. book and notes for today's lesson.

Assessment Strategies

- *Anecdotal*
- *Completed project*
- *Followed directions*
- *Signed up for Board*
- *Completed warm-up, exit ticket*
- *Joined class conversations*
- *Used good keyboarding habits*
- *[tried to] solve own problems*
- *Decisions followed class rules*
- *Left room as s/he found it*
- *Higher order thinking: analysis, evaluation, synthesis*
- *Habits of mind observed*

Steps

Time required: ***45 minutes in one sitting or spread throughout the week, allowing a block of 30 minutes to complete the mindmap, brainstorm, or outline***

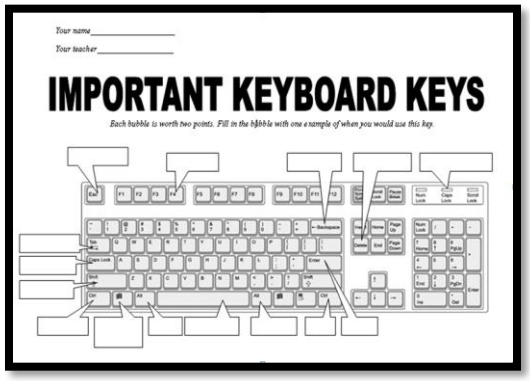
Class warm-up: ***Keyboard homerow--DanceMat Typing or Popcorn Typer (Google sites)***

_____Turn music on to establish a typing rhythm for students. Encourage them to type to the beat.

_____Review Hardware Quiz. Remind students of Mulligan Rule.

_____Give students the important keys quiz, using sample in keyboarding lesson. If students have workbooks, they can fill out the template from there using the class annotation tool. Allow 5-10 minutes for this quiz. They should know these keys.

Figure 3--Keyboard keys quiz



_____If you are going to give this multiple times during the year, treat this first quiz as a benchmark and grade subsequent quizzes based on individual improvement (as you do with the speed/accuracy quiz).

_____Review homework (see end of text for complete list)—homerow practice only this month! Use correct posture, hand position.

_____Start Problem-solving Board. Students stand in front of class, share their problem and solutions, and take questions from classmates. You may model this if necessary. Students follow speaking and listening expectations discussed in class. As they present, fill out assessment rubric (*Figure 35*):

Figure 35—Problem-solving board rubric

PROBLEM SOLVING BOARD

Grading Rubric

Name: _____

Class: _____

Knew question	_____
Knew answer	_____
Asked audience for help if didn't know answer	_____
No umm's, stutters	_____
Look audience in eye	_____
No nervous movements (giggles, wiggles, etc.)	_____
No nervous noises (giggles,)	_____
Overall	_____

_____Any evidence of learning to post on Evidence Board?

_____Discuss the importance of organizing thinking. How have students done this in the past?

_____Common Core asks that students learn ways to scaffold and support a deeper level of understanding to provide an engine for future learning. This lesson discusses two:

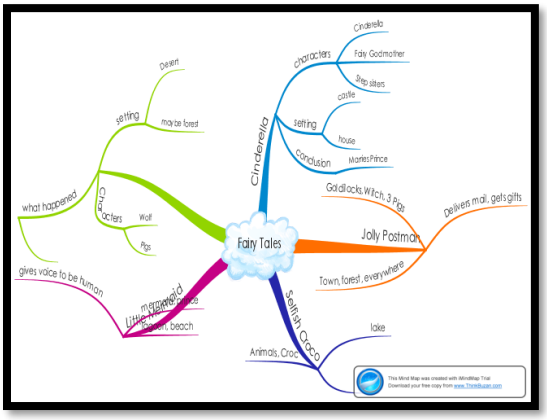
- *brainstorming and mindmapping*
- *outlining*

_____Pick one or both based on the unique needs of your learners and the digital devices you use.

Brainstorming and mindmapping

_____Remind students that they created a mindmap as a large group in first grade (*Figure 36*):

Figure 36—1st grade mindmap



_____This year, students create a mindmap—or brainstorm a topic—in small groups.

_____Introduce concept of 'brainstorming', also called 'mindmapping'—a collaborative visual approach to thinking through and presenting ideas. Brainstorming is a great way to tackle prewriting. It helps students come up with many ideas about a topic.

_____Here are basic classroom brainstorming rules:

- *There are no wrong answers.*
- *Get as many ideas as possible.*
- *Record all ideas.*
- *Do not evaluate ideas presented.*
- *Build new ideas on those of others.*
- *Stress quantity over quality.*

_____General steps for brainstorming:

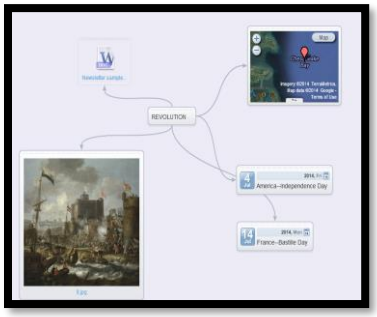
- *Sit in a comfortable group.*
- *Add central idea to middle of page. Include image if possible.*
- *Add big ideas that support theme. Don't worry if contributions don't seem 'big'—they'll find a home later as a sub-idea, connected to another.*
- *Add ideas as they come.*
- *All ideas down? Now drag ideas around to connect topics that relate.*
- *Evaluate placement of ideas to determine if like ideas are grouped appropriately.*
- *If possible, edit connectors to be fatter for main ideas and thinner for sub ideas. This enables the mind to subconsciously visually categorize ideas.*
- *Add emphasis where needed with color, images, fonts, size (if available).*

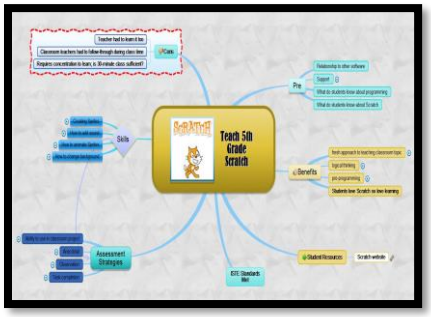
_____There are a lot of tools online to create mindmaps. If you don't have a favorite, visit Ask a Tech Teacher's resource pages for *Brainstorming/Mindmaps* and select one that works for you. Some work better depending upon your digital device. You can also use Google Draw or Word.

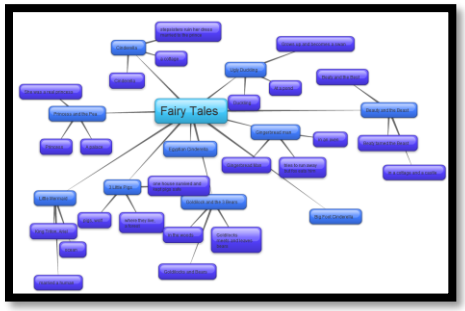
_____Open selected program on class screen to demonstrate.

_____Map a book being read, a historic event, or a mathematical concept. Examples include *Figure 37a* in SpiderScribe; *Figure 37b* in MindMaple; *Figure 37c* in Bubbl.us:

Figure 37a—SpiderScribe; 37b—MindMaple; 37c—Bubbl.us







_____Once you've demonstrated, have small groups map their ideas.
_____For a complete lesson plan on *Brainstorming and Mindmapping*, visit Structured Learning Lesson Plans.

Outlining

_____How students access an outline tool will differ if they use a computer (PC, Mac, and Chromebook) or an iPad. Be familiar with the app you plan to use so you can adapt instructions as needed.

_____Discuss outlining with students. Help them understand that outlines:

- *encourage a better understanding of a topic*
- *promote reflection on a topic*
- *assist analysis of a topic*

_____Open a word processing program. Put heading at top (name, teacher, date). What's the purpose of the heading? Add date with shortkey.
_____If you don't use MS Word or Google Docs on your digital device, try:

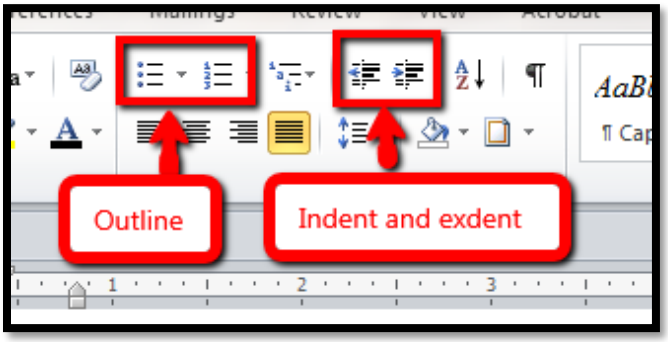
- *OneNote—software, a web app, or an iPad app*

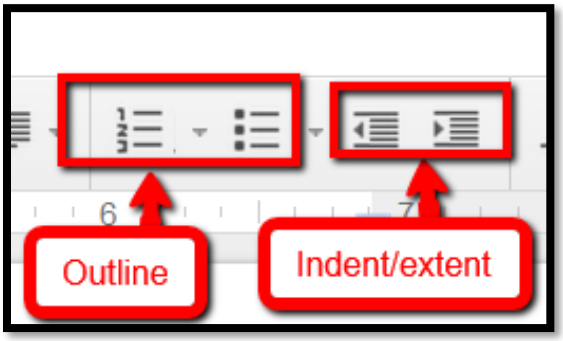
_____If you're an iPad school, try one of these:

- *The Google Docs or MS Word app*
- *Quicklyst – quick notes and list on iPads*
- *OmniOutliner –for iPads and online*

_____Any time students go online, remind them how to do so safely.
_____Center title beneath heading. What's the purpose of a 'title'?
_____Adapt for the toolbar in the word processing program you use. In MS Word and Google Docs, use: 1) bullet or numbered list, 2) indent—push text to right (subpoint), and 3) exdent—push text to left (more important point). See *Figure 38 (*in MS Word—similar in Google Docs*)*:

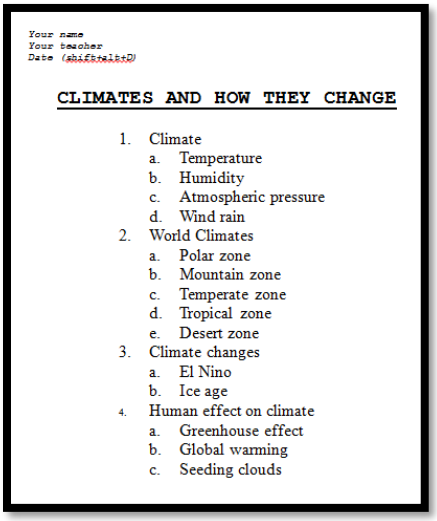
Figure 38a—How to outline in MS Word; 38b—Google Docs





_____Or use tab to indent and Shift+tab to exdent (for Word and Docs)—I like this better.
_____Outline chapter headings, subheadings. Summarize and/or paraphrase relevant points in text.
_____Once completed (*Figures 39a-c*), work with a neighbor to add information by editing the outline. Use data from print/digital sources, class discussion, and personal experience. Note source where relevant.
_____Work individually or in small groups.

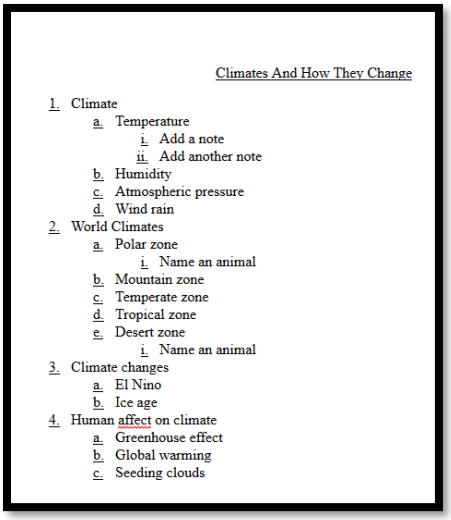
Figure 39a—Outline in Word; 39b—Google Docs; 39c--Workflowy



Your name
Your teacher
Date (shift+alt+D)

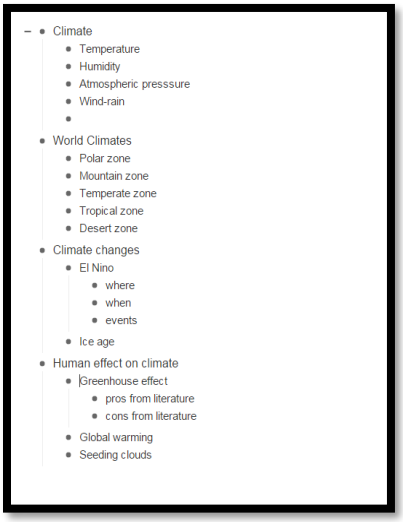
CLIMATES AND HOW THEY CHANGE

1. Climate
   a. Temperature
   b. Humidity
   c. Atmospheric pressure
   d. Wind rain
2. World Climates
   a. Polar zone
   b. Mountain zone
   c. Temperate zone
   d. Tropical zone
   e. Desert zone
3. Climate changes
   a. El Nino
   b. Ice age
4. Human effect on climate
   a. Greenhouse effect
   b. Global warming
   c. Seeding clouds



Climates And How They Change

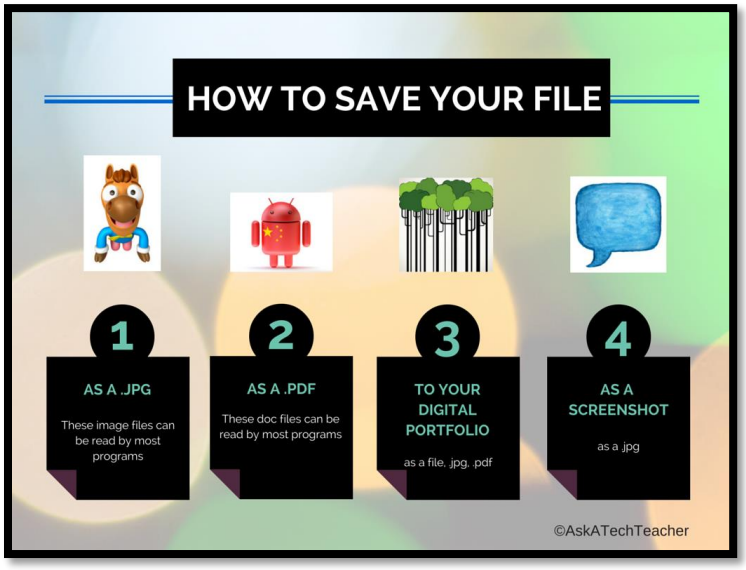
1. Climate
   a. Temperature
      i. Add a note
      ii. Add another note
   b. Humidity
   c. Atmospheric pressure
   d. Wind rain
2. World Climates
   a. Polar zone
      i. Name an animal
   b. Mountain zone
   c. Temperate zone
   d. Tropical zone
   e. Desert zone
      i. Name an animal
3. Climate changes
   a. El Nino
   b. Ice age
4. Human affect on climate
   a. Greenhouse effect
   b. Global warming
   c. Seeding clouds



- Climate
  - Temperature
  - Humidity
  - Atmospheric presssure
  - Wind-rain
  -
- World Climates
  - Polar zone
  - Mountain zone
  - Temperate zone
  - Tropical zone
  - Desert zone
- Climate changes
  - El Nino
    - where
    - when
    - events
  - Ice age
- Human effect on climate
  - Greenhouse effect
    - pros from literature
    - cons from literature
  - Global warming
  - Seeding clouds

_____Remind students: Every time they use computers, practice keyboarding skills.
_____Remind students: Save early save often. Why? How often?
_____Throughout class, check for understanding.
_____If printing, preview to be sure outline takes only one page. Save (or save-as? Which is right for this situation) with student last name in the file name. Close with Alt+F4.
_____Why include student name in file name when saving? Demonstrate a search for a student document. See how their files show up even if they didn't save it to their digital portfolio. Putting last name in file name makes it harder to lose work.
_____Remind students to transfer knowledge to classroom or home.
_____Review how students save (*Figure 40* is a thumbnail of poster in Appendix):

Figure 40—How to save your file



Class exit ticket: ***Share or email outline to teacher.***

Differentiation

- *Add Board presenters to class calendar.*
- *Add Blank Keyboard quiz to class calendar.*
- *Set up a 'Discussion Board' on class website or blog where students post the problem solving question they answered in their presentation. This can be a resource in student daily work and during the upcoming (optional) assessment.*
- *Early finishers: visit class internet start page for websites that tie into classwork.*
- *Show how to give credit for sources with an online site like EasyBib (Google for address)*

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Lesson #17 Spreadsheet Formulae

Vocabulary	Problem solving	Skills
• *Border* • *Cell* • *Decimal place* • *Formulas* • *Place value* • *Right-aligned* • *Row/Column* • *Spreadsheet*	• *I can't find my file (where did you save it?)* • *Formula doesn't work (click cell and check it)* • *All I get is ***** (cell isn't large enough; widen column)* • *I don't see decimal points (check cell formatting)*	**New** *Arrays* *Modeling w/ spreadsheets* *Merge-center* **Scaffolded** *Formulae for add, subtract multiply, divide*
Academic Applications *Math, any class that requires data evaluation*	**Materials Required** *spreadsheet program/rubric, Google Earth rubric, keyboard tool, Evidence Board badges, student workbooks (if using)*	**Standards** *CCSS: Math.Content.5.NBT.B.7* *NETS:1d, 3d, 5a-b*

Essential Question

What are the essential skills required to analyze numbers?

Big Idea

Spreadsheets are a unique way to share information

Teacher Preparation

- Talk with grade-level team about essential spreadsheet skills (formulas, formatting, graphs, etc.).
- Know how grade-level team teaches place value.
- Continue to collect words for Speak Like a Geek Board.
- Be prepared to use domain-specific tech vocabulary.
- Know whether you need extra time for this lesson.
- Is class shorter than 45 minutes? Highlight critical items and leave the rest for 'later'.
- Know which tasks weren't completed last week and whether they are necessary to move forward.
- If you offer afterschool tech help and it's manned by students, verify they will be there.

Assessment Strategies

- *Anecdotal*
- *[tried to] solve problems*
- *Decisions followed class rules*
- *Left room as student found it*
- *Shared evidence of learning*
- *Used prior knowledge*
- *Understood decimal places*
- *Completed warm-up, exit ticket*
- *Completed project*
- *Joined classroom conversations*
- *Higher order thinking: analysis, evaluation, synthesis*
- *Habits of mind observed*

Steps

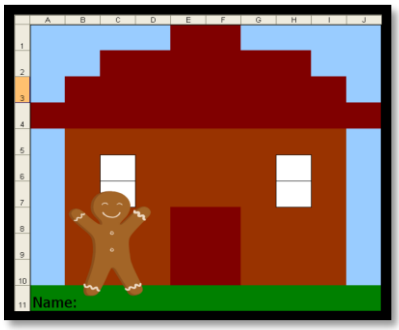
Time required: ***45 minutes either in one sitting or spread throughout the week, with a 10 minute block for keyboarding, 10 minutes for start-up tasks, and 25 minutes for spreadsheet lesson***

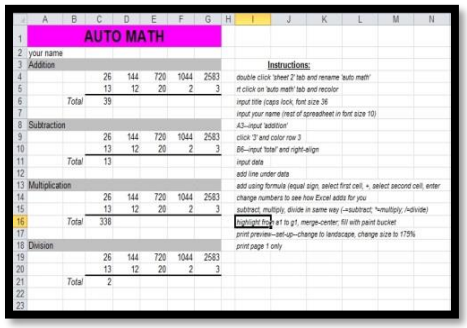
Class warm-up: ***Keyboard practice. Remind students to pay attention to posture, hand position, elbows, and flying fingers.***

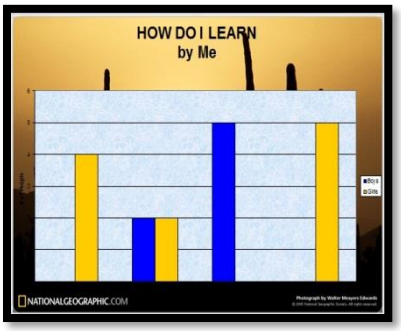
_____Want a 'different' keyboard practice? Visit Ask a Tech Teacher *Keyboarding* resource pages.
_____Continue with Google Earth Board presentations.
_____Any evidence of learning for Evidence Board?

_____Remember spreadsheet projects from 2nd (*Figure 89a*-Gingerbread House), 3rd (*Figure 89b*—Auto Math) and 4th (*Figure 89c*—Graphs) grade—if you used the SL tech curriculum in the past:

Figure 89a-c: Spreadsheet projects K-4





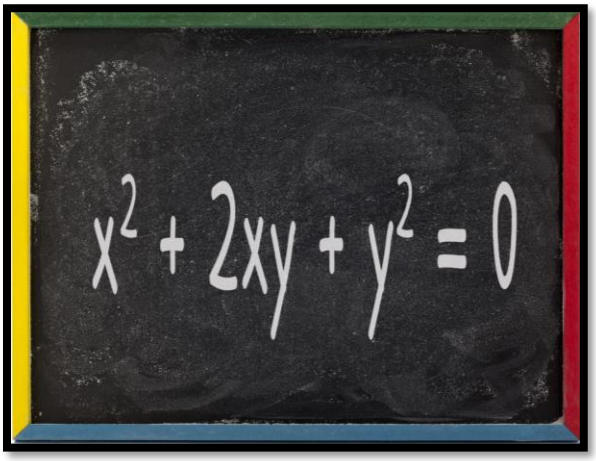


_____For this Lesson, use Numbers, Excel, or Google Spreadsheets. If you have Chromebooks, use the online versions (Office 365 and Google Drive). If you have iPads, use the app versions of MS Office or Mac, but know they will differ from the fully-featured program. Know the differences so you can adapt the project to accommodate them.

_____Today we explore spreadsheet formulas. This lesson ties into pre-programming, logical thinking, and critical thinking (a follow up on coding).

_____What does it mean to 'model' a concept? What are some models you are aware of? Anyone make model airplanes? Lego models? Discuss how important it is that modeling is done carefully, with precision. Each tool used must be exact and structured. In this way, anyone who sees a 'model' gets the message. See *Figures 90a* and *90b* for a math and a science model:

Figure 90a-b: Academic formulae



_____Discuss how spreadsheets support the following Standards for Mathematical Practice:

- *Make sense of problems and persevere in solving them.*
- *Reason abstractly, quantitatively.*
- *Construct viable arguments; critique reasoning of others.*
- *Model with mathematics.*
- *Use appropriate tools strategically.*
- *Attend to precision.*
- *Look for and express regularity in repeated.*

_____Why pick spreadsheets for these goals rather than DTP? Have students revisit the chart you

Element	Slideshow	Word processing	Spread—sheets	DTP
Purpose	*Share a presentation*	*Share words*	*Turn numbers into information*	*Share information using a variety of media*
Basics	*Graphics-based* *Design is important to content* *Layout communicates* *Few words, lots of images*	*Text-based* *Design is secondary to content* *Layout may detract from words* *Primarily words communicate*	*Number-based* *Focus on tables, graphs* *Little text; lots of statistics and date* *Almost no words*	*Mix of media—equal emphasis on text, images, layout, color*
Sentences	*Bulleted, phrases*	*Full sentences with proper conventions*	*None*	*Full sentences, bullets,*
Content	*Slides cover basics, to remind presenter what to say*	*Thorough discussion of a topic. Meant to be complete document*	*Statistics, data, charts, graphs*	*To draw an audience in;*
Use	*As a back-up to presentation*	*As complete resource*	*To support other presentation meth-*	*Good way to group infor-*

presented when discussing the question (*Figure 91*) earlier this year:

Figure 91—Compare/contrast digital tools

			ods	*mation for easy consumption*
Presentation	*Speaker presents with their back to the slideshow*	*Speaker reads from document*	*Speakers uses it in a presentation or 1:1*	*Speaker passes out as a handout or take-way*
What else				

_____Why are spreadsheets an appropriate math tool? What insight do they offer (for example, to double check answers)?

_____If students use workbooks, have them fill in the cells in the sample.

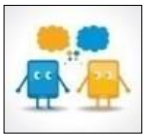
_____In this lesson, choose one of these two activities:

- Practice building arrays as an alternative method for answering math problems. This can tie into class discussions on arrays.
- Review spreadsheet formulae for adding, subtracting, multiplying, and dividing discussed in 3rd grade (from Auto Math).

Arrays

_____If you haven't built arrays in a spreadsheet program, you may want to choose this over a review of formulae to widen student numbers literacy. Open spreadsheet program. Double-click 'sheet one' tab; rename 'Arrays'; change tab color independently.

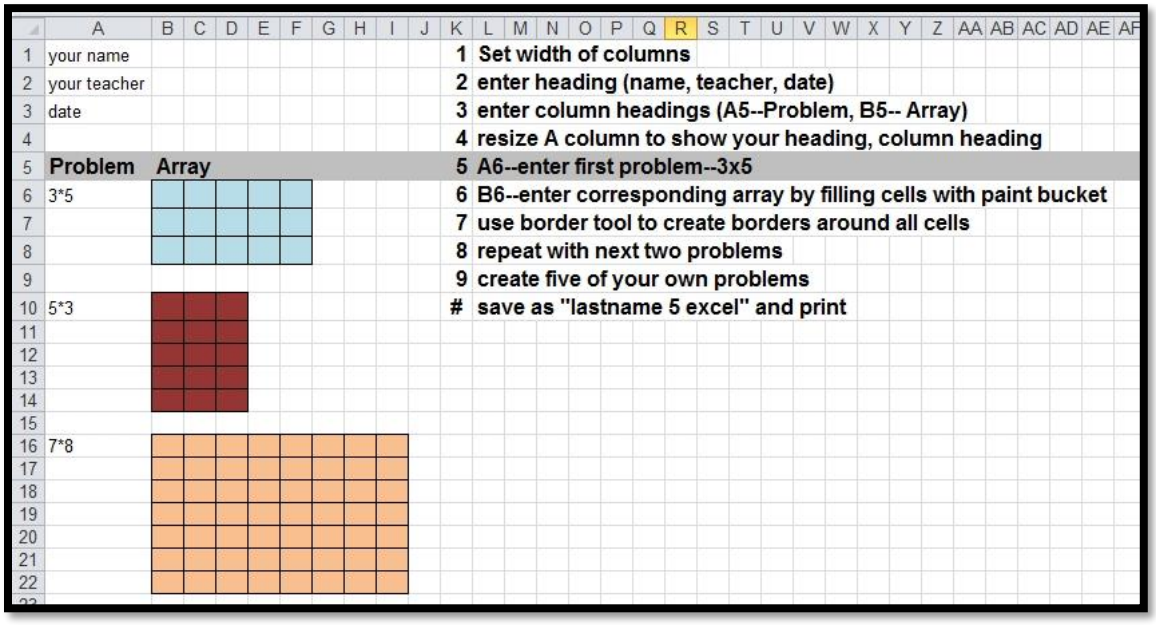
_____Using *Figure 92* as an example, students build arrays by coloring blocks and adding cell borders to answer relevant math problems.



_____Students have used spreadsheets since 1st grade. Ask them to work as independently as possible (or in small groups) using their problem solving strategies to go through as many steps as possible on their own.

_____Be sure to show students how to set column width so cells are square.

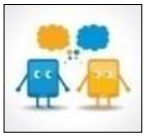
Figure 92—Arrays with spreadsheets



_____When done, save/print/share/publish, as is the custom in your classroom.

Automath

_____This is a review of skills introduced in 3rd grade. Students should work as independently as possible, only requesting teacher assistance after they've exhausted their problem-solving strategies (from an earlier unit).



_____Follow directions on the right side of *Figure 93* under 'Instructions'.

Figure 93—Automath with spreadsheets

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	AUTO MATH													
2	your name													
3	Addition								**Instructions:**					
4			26.4	14.4	72	104.4	258.3		*double click 'sheet 2' tab and rename 'auto math'*					
5			13.3	12.2	20.8	2.4	3.9		*rt click on 'auto math' tab and recolor*					
6		*Total*	39.7						*input title (caps lock, font size 36*					
7									*input your name (rest of spreadheet in font size 10)*					
8	Subtraction								*A3--input 'addition'*					
9			26.4	14.4	72	104.4	258.3		*click '3' and color row 3*					
10			13.3	12.2	20.8	2.4	3.9		*B6--input 'total' and right-align*					
11		*Total*	13.1						*input data*					
12									*add line under data*					
13	Multiplication								*add using formula (equal sign, select first cell, +, select second cell, enter*					
14			26.4	14.4	72	104.4	258.3		*change numbers to see how Excel adds for you*					
15			13.3	12.2	20.8	2.4	3.9		*subtract, multiply, divide in same way (-=subtract; *=multiply; /=divide)*					
16		*Total*	351.12						*highlight from a1 to g1, merge-center; fill with paint bucket*					
17									*print preview--set-up--change to landscape, change size to 175%*					
18	Division								*print page 1 only*					
19			26.4	14.4	72	104.4	258.3							
20			13.3	12.2	20.8	2.4	3.9							
21		*Total*	1.985											

_____If students have workbooks, have them turn to that page as they work.

_____**A1—**add title (Auto Math), font size 36; merge-center cells A1-G1 (new skill for fifth grade); color with paint bucket.

_____**A2—**add student name.

_____**A3—**type 'Addition'; click on row 3 to select entire row; use paint bucket to color. Or, select A3-G3 and color with paint bucket.

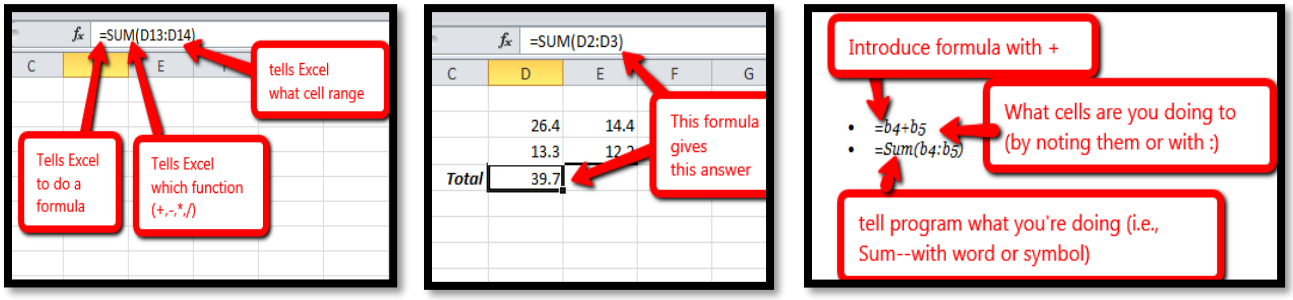
_____Before inputting numbers, discuss place value. Show students how to format cells for multiple decimal places.

_____Add line beneath bottom row of data.

_____In cell beneath line, use formula to solve math problem. The easiest way to create a formula is (see *Figures 94a-c*):

- *type =*
- *select first cell you want*
- *input function —,+, /,**
- *select second cell you want to use*
- *push enter for answer*

Figure 94a-c: Deconstructing spreadsheet formulae



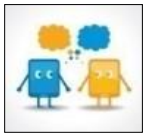
_____In short: A formula is built from four parts:

- = *(introduce formula)*
- ***Function*** *(add, subtract, multiply, divide)*
- ***Location*** *(cells that function applies to)*
- ***( )*** *(group numbers)*

_____Resulting formula will look like *Figure 94c.*

_____Add 'Total' next to the answers; right-align in cell. Complete at least five problems by inputting the formula (not answers) into the spreadsheet.

_____Before entering answer formula, try to get the answer with mental math. This can be done several ways:



- *poll class for answer*
- *race the spreadsheet—will you or program get answer first?*
- *work in pairs—one student mentally calculates answer while second uses formula*

_____Finish problems for other functions in similar fashion using:

- ***+=add***
- ***- = subtract***
- **** = multiply***
- ***/ = divide***

_____In spreadsheet, analyze relationship between these two variables. Identify which are 1) dependent, and 2) independent variables. How does changing one affect the other?

_____Look both for general methods and shortcuts. For example, copy formula *=b4+b5* and replace addition symbol with * for multiplication. Why does this work?

_____When answer shows up, does it look correct:

- *eyeball to determine if it is accurate*
- *use mental math*
- *guess-and-check*
- *use algorithm from class*

_____This can be done in small groups.

_____If students are expected to print, have them switch to 'landscape'; adjust size to fit one page. Share/publish as required.

_____Throughout class, check for understanding.

Class exit ticket: ***Have students 1) line up in arrays), or 2) change data in three cells and watch the program recalculate—depending upon which option you selected.***

Differentiation

- *Do one set of numbers with decimal places, another rounding to next whole number. Evaluate difference between answers.*
- *Have students use a spreadsheet to complete math homework.*
- *Early finishers: visit class internet start page for math websites.*

I cannot conceive that anybody will require multiplications at the rate of 40,000 or even 4,000 per hour.

— F. H. Wales, 1936

Intentionally deleted

Classroom Posters

1. Backspace and Delete
2. Chromebooks shortkeys
3. Common Tech Problems
4. Digital Law
5. Email etiquette
6. Here's What We've Done
7. How to Save—4 Ways
8. How to solve problems
9. I Can't Find My File
10. Internet Research
11. iPad shortkeys
12. Keyboard Posture
13. K-5 Keyboarding Stages
14. Landscape
15. Netiquette Rules
16. Portrait
17. Save or Save-as
18. Save Early Save Often
19. Select-Do
20. Undo is Your Friend
21. What's a Mulligan

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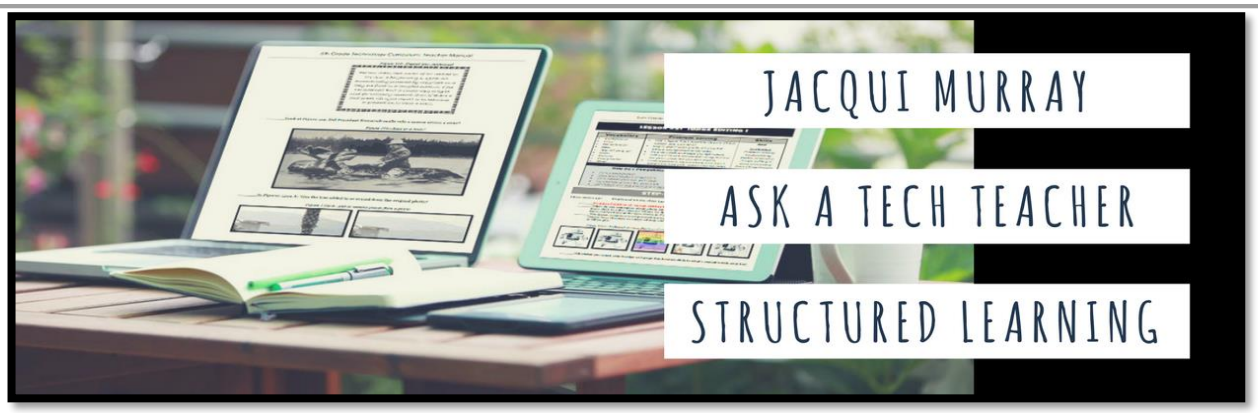

Which book	Price (print/digital/Combo)
K-8th Tech Textbook (each)	*$25.99 + p&h*
K-8 Combo (all 9 textbooks)	*$248 and up + p&h*
K-8 Student workbooks (license)	*$199 per grade level and up*
35 K-6 Inquiry-based Projects	*$31.99/25.99/52.18 + p&h*
55 Tech Projects	*$18.99 and up–digital only*
K-8 Keyboard Curriculum—3 options	*$20 and up + p&h*
K-8 Digital Citizenship Curriculum	*$29.95 and up*
CCSS—Math, Lang., Reading, Writing	*$26.99 ea*
K-5 Common Core Projects	*$29.95/23.99/48.55 + p&h*
Themed webinars	*$8-30*
PD classes (online—for groups)	*$795*
Summer tech camp for kids	*$179 + p&h*
College credit classes (online)	*$497 and up*
Digital Citizenship certificate class	*Starts at $29.99*
Classroom tech poster bundles	*Start at $9.99*
PBL lessons--singles	*$1.99 and up*
Bundles of lesson plans	*$4.99 and up (digital only)*
Tech Ed Scope and Sequence	*$9.99 and up (digital only)*
New Teacher Survival Kit	*$285-620+ p&h*
Homeschool Tech Survival Kit	*$99 + p&h*
Mentoring (30 min. at a time)	*$50 and up/session*
169 Tech Tips From Classroom	*$9.99 (digital only)*
Consulting/seminars/webinars	*Call or email for prices*

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