BIG DATA IN EDUCATION

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mindbytes

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www.mindbytes.co

RUTGERS School of Engineering

THINKSTER MATH

New Jersey Association For Gifted Children

Mount Laurel Library

givingcycle

What is Big Data?

Data	Facts
Information	Made meaningful
Big Data	Large data sets

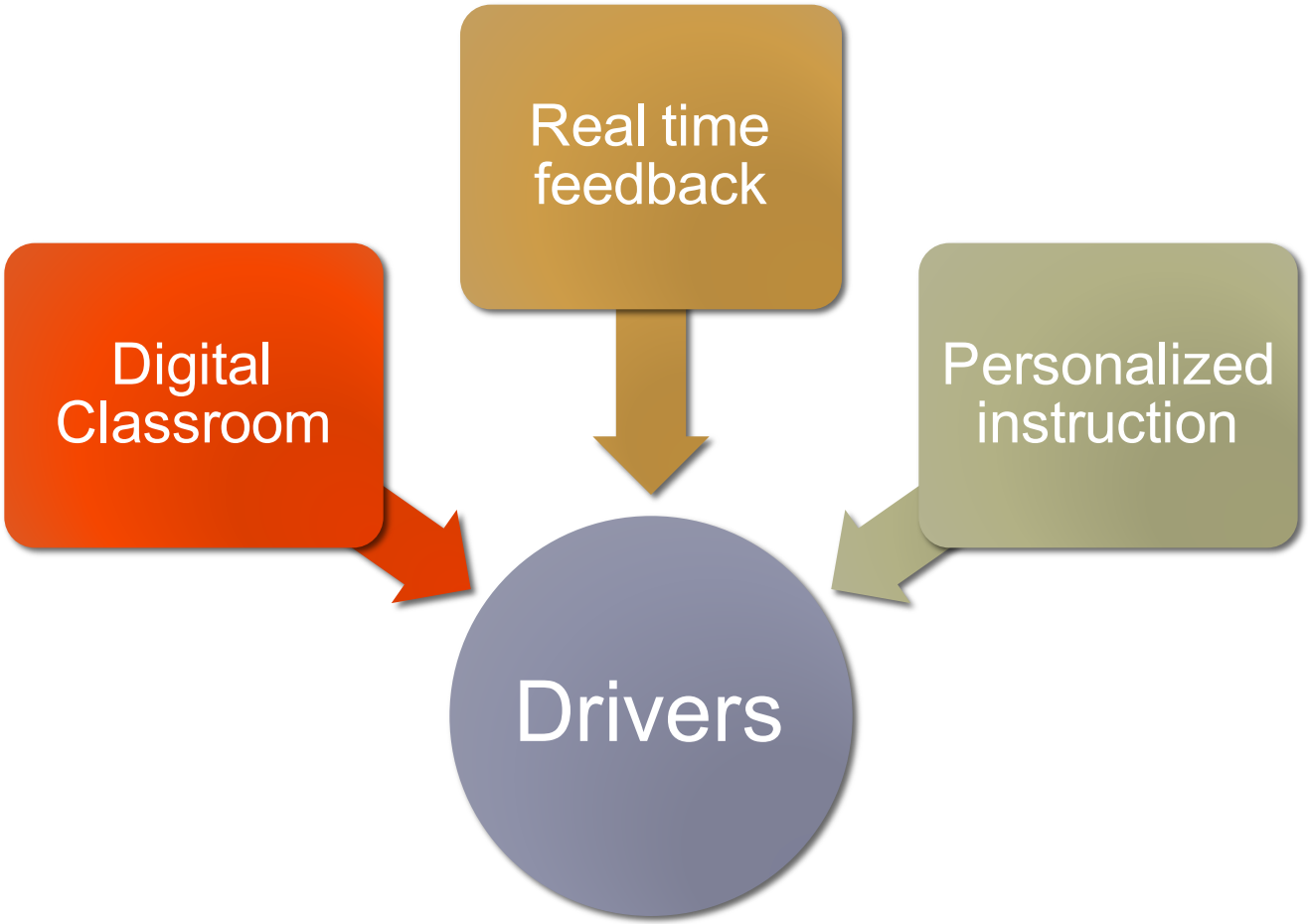
Big Data

Large Data Sets integrated from traditional & digital sources

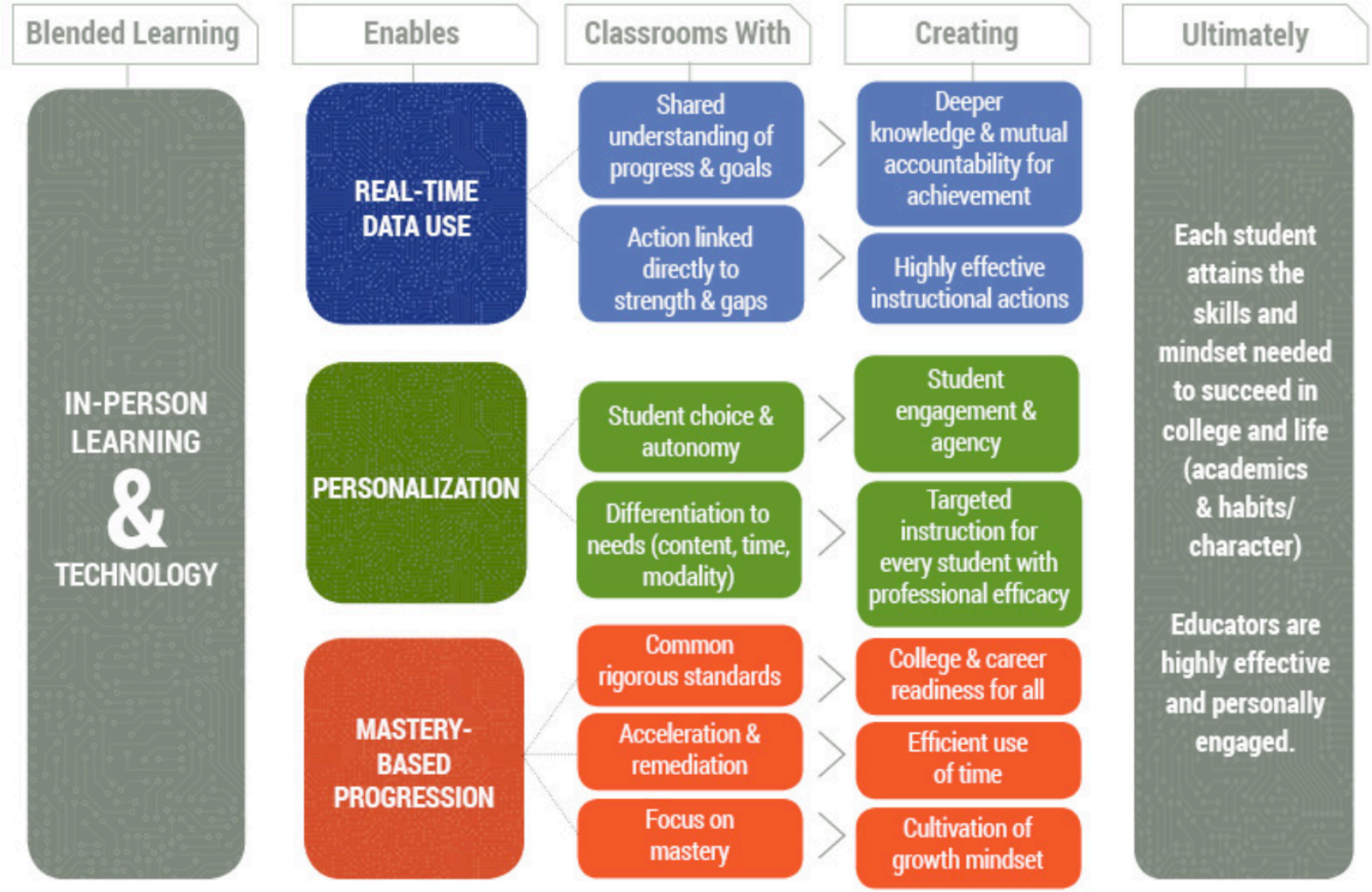
Analyze user behavior

Predict user behavior

Big Data in K-12



Blended Learning



SOURCE: The Learning Accelerator

Goals

Students

- Assess what student knows?
- Identify the gaps
- Attain the right skill level

Teachers

- Teaching practices
- Customize to each student's individual skills, abilities, and preferences
- Deep analysis on education patterns

Parents

- Their child's skill & Knowledge level
- Education pattern
- Child's progress

Personalize instruction & data driven operational decisions

Everyone talks about it

Tyler had 28 stickers. His mom gave him some more stickers for his birthday. Now Tyler has 61 stickers. How many stickers did his mom give him?

What happened?

2nd Grader

Source: NCTM

What happened?

"First I drew twenty-eight stickers for Tyler. Then I needed some more, so I kept counting," Yim explains.

Mrs.Brown asks Yim to show her how he counted. He touches his pencil to each circle as he answers, "Twenty-nine, thirty, thirty-one…"

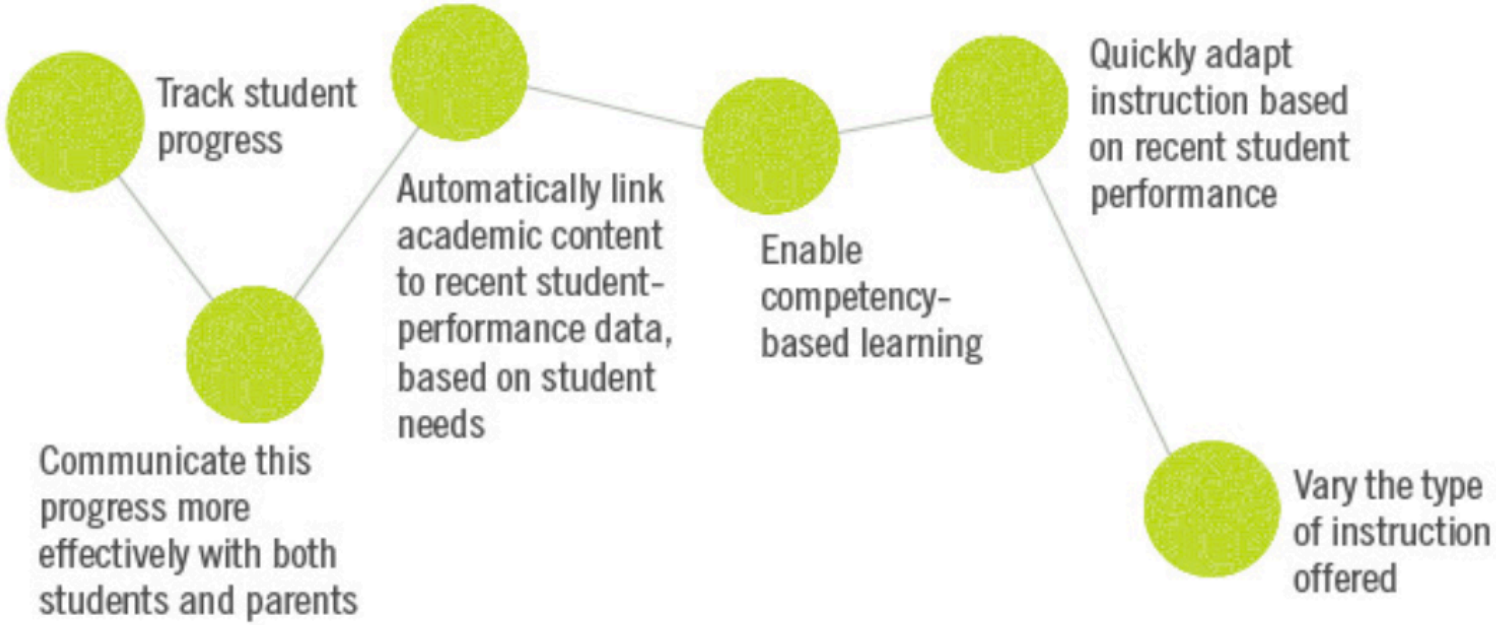
Mrs.Brown notices that Yim hesitates momentarily at the end of some decades—from 49 to 50 and from 59 to 60—as he thinks about the name for the next number. She knows that English is Yim's third language and that the pauses reflect his progress in learning the decade names.

The brief hesitations, however, cause him to lose the rhythm of touching one circle for each number, which accounts for his error.

Is that all?

Source: NCTM

As is



SOURCE: Education Week Research Center/*EdWeek Market Brief*

Is this enough?

Is this data enough?

MAJOR CONTENT

Your child performed about the same as students who **approached expectations.** Students meet expectations by solving problems involving volume of prisms, adding, subtracting, multiplying and dividing with multi-digit whole numbers, decimals, and fractions.

EXPRESSING MATHEMATICAL REASONING

Your child performed about the same as students who **met or exceeded expectations.** Students meet expectations by creating and justifying logical mathematical solutions and analyzing and correcting the reasoning of others.

ADDITIONAL & SUPPORTING CONTENT

Your child performed about the same as students who **met or exceeded expectations.** Students meet expectations by solving problems involving writing and interpreting numerical expressions, converting measurements, graphing points, classifying geometric shapes, and representing data.

MODELING & APPLICATION

Your child performed about the same as students who **did not yet meet or partially met expectations.** Students meet expectations by solving real-world problems, representing and solving problems with symbols, reasoning quantitatively, and strategically using appropriate tools.

LEGEND

Your child performed about the same as students who:

- Met or Exceeded Expectations
- Approached Expectations
- Did Not Yet Meet or Partially Met Expectations

Define Data Requirements

- Student Data
- Teacher Observation
- Formative Assessments
- Summative Assessments
- Learning Activities

Challenges

- Data from disparate sources
- Overwhelmed with large amounts of data
- Incompatibility of the data systems
- Time consuming tools to make data analysis
- Inconsistency in the level of detail & quality of data
- Delay in access to the data and modify instruction
- Privacy & protection of student data

Guidelines

- Setting learning objectives
- Designing the desired dashboard
- CEDS standards - The Common Education Data Standards (CEDS)
- National Education Technology Plan
- Privacy Technical Assistance Center – Has information includes
- Protecting Student Privacy While Using Online Educational Services:
  - Digital Learning now –Report Cards
  - Digital Citizenship
  - Family Time with Apps -Privacy settings, information collected, advertisement allowed etc.

Protection for Student Data

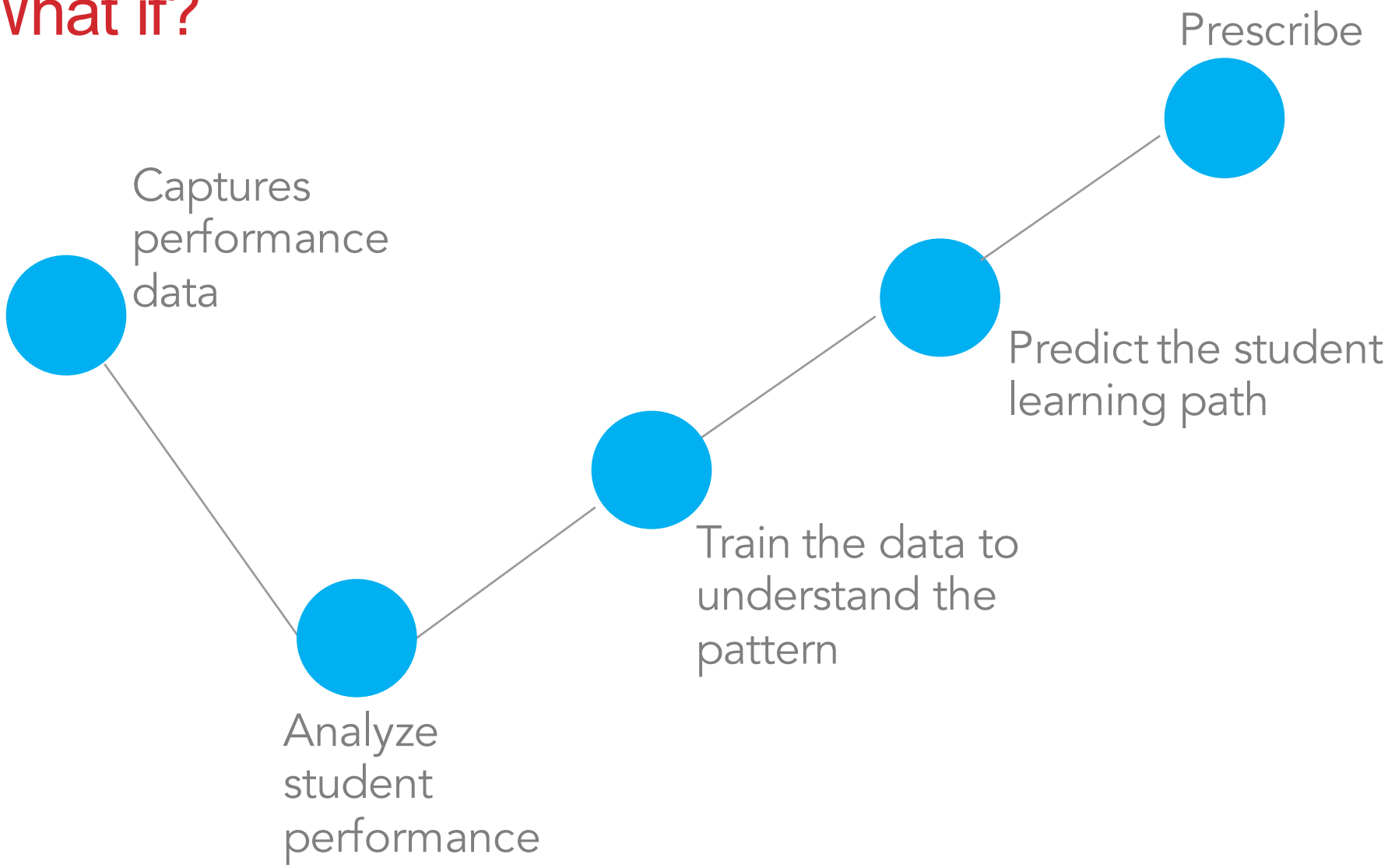
- School should disclose what kind of data is collected by the school or third parties and how are they being used.
- Click wrap agreements – click on a button to accept the provider's terms of service
- The U.S. Department of Education offers schools OFFICE OF Educational Technology 80 and families examples, training, and other assistance in navigating privacy concerns through the Privacy Technical Assistance Center.
- FERPA
- The Children's Internet Protection Act
- The Individuals with Disabilities Education Act (IDEA)

Collect better data

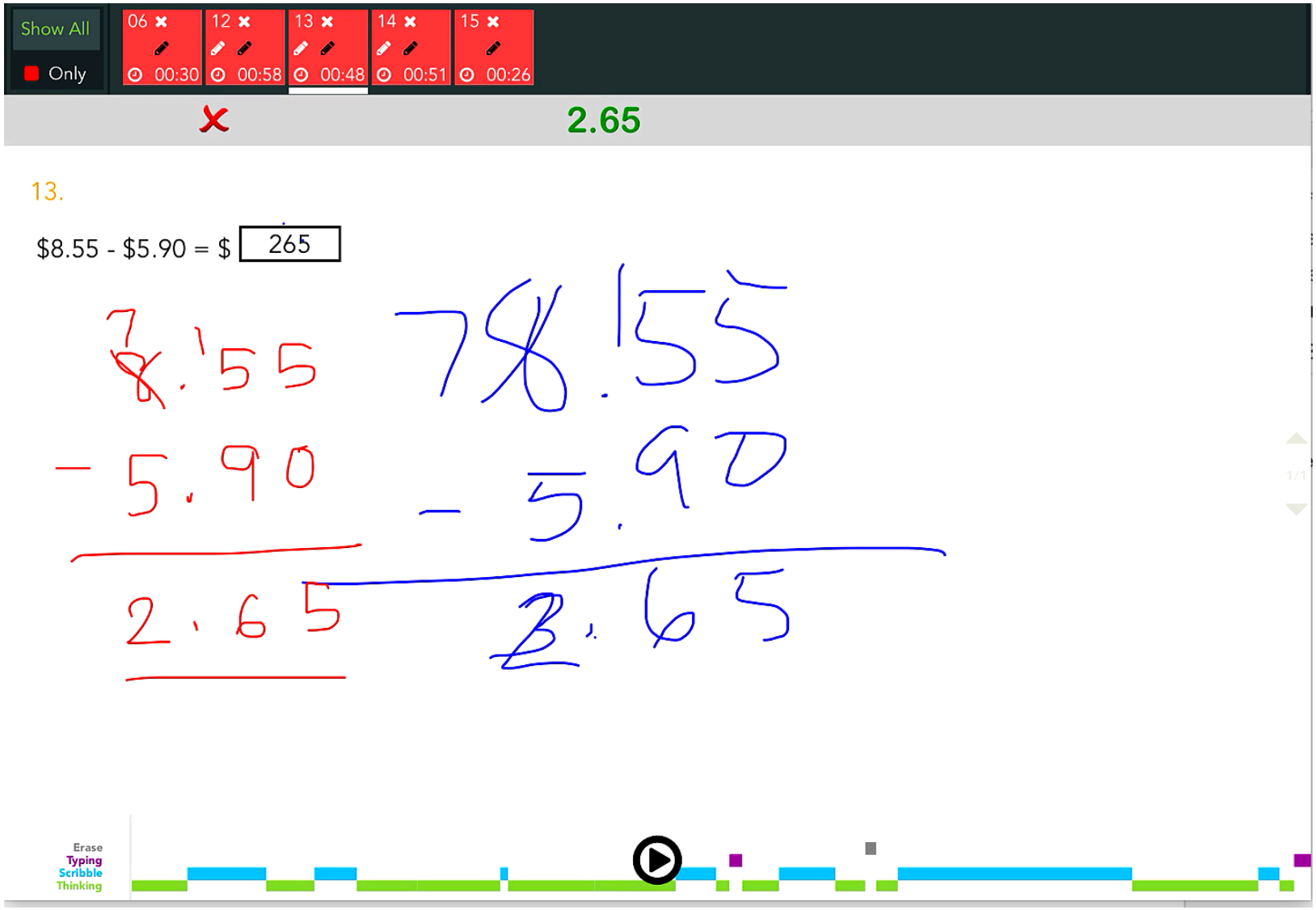
- Evaluate the data that are provided by the tools – is the data useful?
- Draw a framework of what data you need so that you can give the framework to edtech companies and request data in that format.

- Evaluate what data is being given –
  - Districts should make sure vendors are providing data from similar districts in terms of both size and student population served
- Request for pilot program

What if?


Prescribe
Captures performance data
Predict the student learning path
Train the data to understand the pattern
Analyze student performance

What if?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- 5.90
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Erase
Typing
Scribble
Thinking

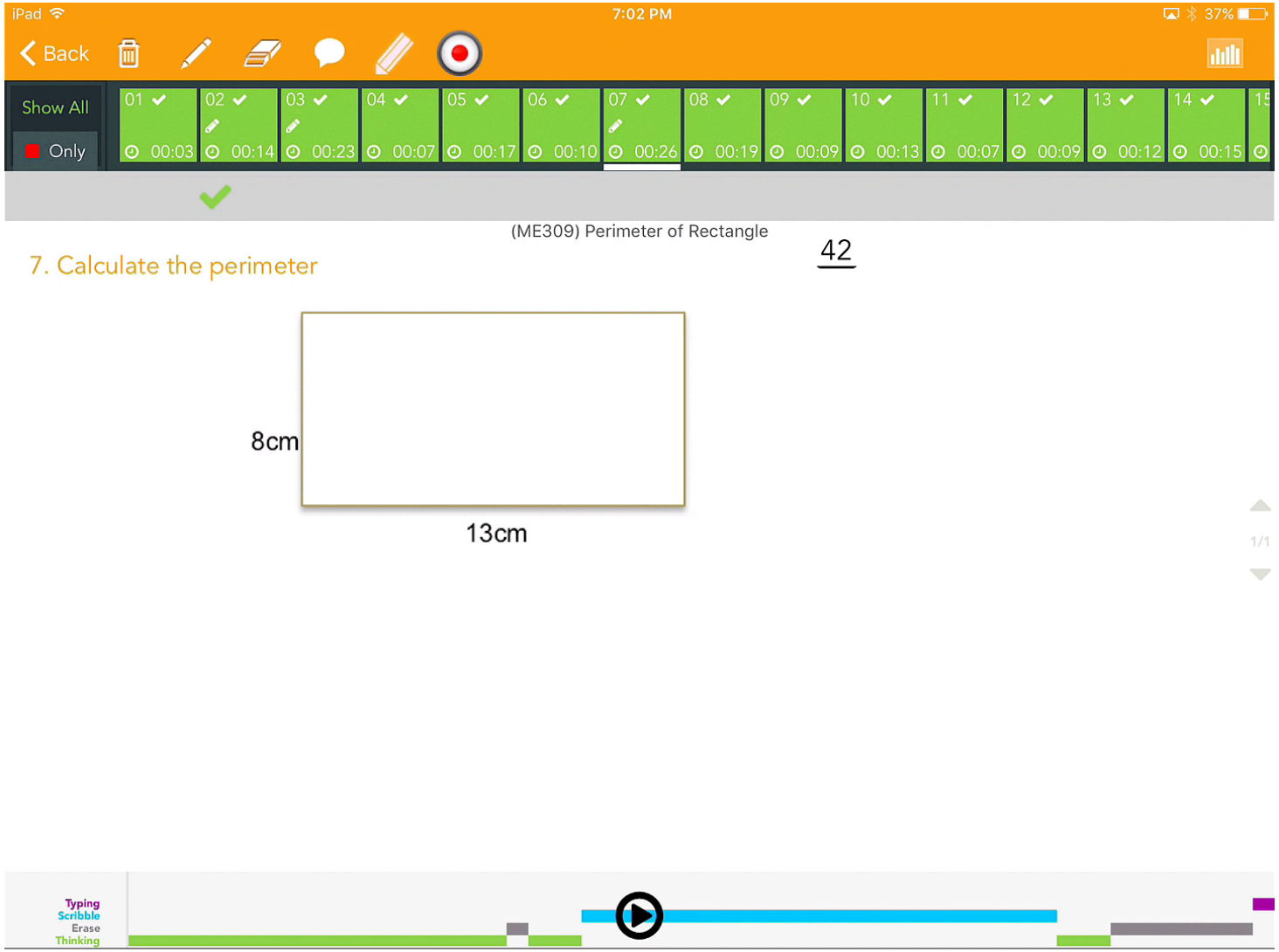
What if?

Big data can predict **which candidates for teaching jobs** are likely to have the biggest impact on student test scores

Where population growth will require that **new school buildings be built in the future**.

Big data capture non-cognitive competencies such as teamwork, persistence, etc.

What if?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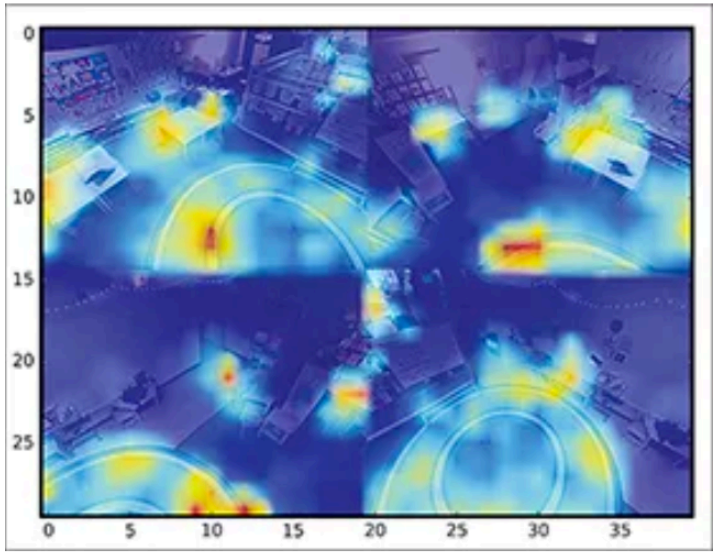
(ME309) Perimeter of Rectangle
42
7. Calculate the perimeter
8cm
13cm
1/1
Typing
Scribble
Erase
Thinking

Future of Big Data



"Heat maps" of activity in AltSchool classrooms are generated by applying motion-tracking algorithms to video footage from constantly running cameras. To date, the information has been used primarily for operational purposes—to guide the company's real estate team in finding properties easily converted to classroom space.
—AltSchool

Now AltSchool's head of technical R&D, is at the forefront of developing similar "passive observation" such as **students' engagement levels, emotional states, and more**.

Cognitive Teacher Assistant

Teacher:
Cordelia, you did OK on your latest mathematics test, you got 72%. It looks like the algebra questions were areas where you struggled. Is that a fair assessment?

Cordelia:
Yes, I'm not sure I really get algebra. Are there any particular areas where I could improve?

Teacher:
Well, let's see what my assistant suggests.

Cognitive-enabled teacher assistant:
From an analysis of Cordelia's learning profile and her last five tests, algebra is a relatively weak area for her in mathematics. Based against learning outcomes of 1.2 million similar Year-8 students with matching learning characteristics, her understanding could be improved by either reviewing algebra module 2.3 or looking at instructional video 7.

Teacher:
Cordelia, I think you would find the video suits your learning style better. I suggest that you start with that and then we'll see how you get on.

Source : Education week

Thank you!

Case 1

What if?

Picture children are wearing Fitbitlike devices that track everything from their heart rates to their time between meals.

Future of K12 education - AltSchool, it has the most aggressive, far-reaching foray into the world of big data and analytics that the K12 education sector has seen to date.

The resulting insights—"that 6th graders perform better in math after exercising

girls in a particular science class are bored because boys use the lab equipment more frequently"

Johnny is using new vocabulary words in conversations with his friends—would be fed to teachers, parents, and students

Source : Education week

Insight for parents - Example

- Student has high proficiency in interpreting the word problems, make connections and model the procedure that is required to solve the problems. The student demonstrates understanding and applying concepts in solving
  - Addition word problems
  - Estimation word problems
  - Multiplication word problems

- Student has indicated that they need help in interpreting the word problems, make connections and model the procedure that is required to solve the problems. The student demonstrates understanding and applying concepts in solving
  - Subtraction word problems

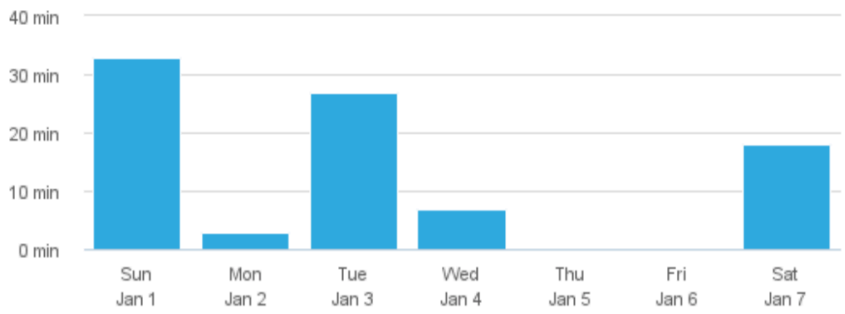
Case 2


This week on IXL...
SHARE
Amogh deserves a round of applause!
Amogh won 1 award this week.
Learn more
hours practiced
1:28
questions answered
376
skills practiced
11

Case 3

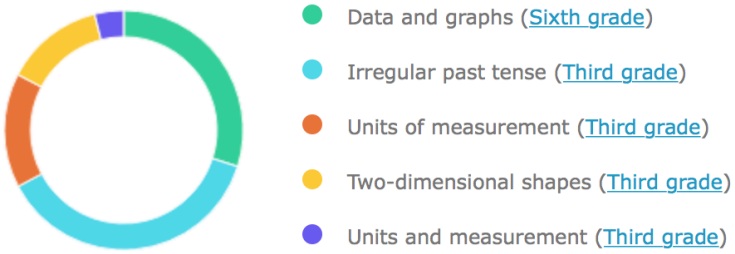
When did Amogh Biradar practice?

Time spent per day



What did Amogh work on?

Time spent per category



Grading period: Q2
Student : Amogh
Course : Mathematics
Period : 6/A\
Instructor : Michelle

Current overall grade**: A

11/17/16 "Multiplication and Division Story Problems x .20" Grade: A (100/100 = 100%)
11/18/16 "Unit 1 Quiz 3 4.5 x .30" Grade: B (87/100 = 87%)
11/21/16 "Unit 1 Mult Div Assess 4.6 x .30" Grade: A (100/100 = 100%)
11/22/16 "Unit 1 Math Test WORK x .30" Grade: A (100/100 = 100%)
11/22/16 "Unit 1 Math Test ONLINE x .30" Grade: A (100/100 = 100%)
12/7/16 "U2 CW Data Details x .20" Grade: B (82/100 = 82%)
12/7/16 "U2 CW Favorite Fruit Bar Graph x .20" Grade: A (90/100 = 90%)
12/8/16 "CW Pictograph Brain Pop Quiz x .30" Grade: B (80/100 = 80%)
12/9/16 "MP2 Today's Number 1 x.20" Grade: A (100/100 = 100%)
12/13/16 "Unit 2 CW Parts of a Bar Graph x .20" Grade: A (98/100 = 98%)
12/15/16 "U2 1.9 Quiz 1 x .30" Grade: A (100/100 = 100%)
12/19/16 "U2 CW More Feet and Inches x .20" Grade: A (100/100 = 100%)
12/21/16 "U2 2.5 Quiz 2 x .30" Grade: B (88/100 = 88%)
12/21/16 "U2 CW Feet and Inches" Grade: A (99/100 = 99%)
1/6/17 "Unit 2 Math Test ONLINE x.30" Grade: B (86/100 = 86%)
1/6/17 "Unit 2 Math Test WORK x .30" Grade: * (--/100)

^ - Score is exempt from final grade
* - Assignment is not included in final grade
** - This final grade may include assignments that are not yet published by the teachers. It may also be a result of special weighting used by the teacher.