MS4PPSSA and

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12 million problems solved by 50,000 students. $15,000,000 in Funding
Does it work?
Recruited 44 Schools in Maine

All 7th Grade Teachers in each School

~2800 Students
Existing Methods

ASSISTments
We operate in a space that relies on and supports the teacher.
ASSISTments is Feedback

For the student

These students know immediately if they answered correctly or incorrectly.
<table>
<thead>
<tr>
<th>Student/Problem</th>
<th>PRAHE5Y</th>
<th>PRAHE5Z</th>
<th>PRAHEZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unanonymize]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Average Graph</td>
<td>27%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>Common Wrong Answers</td>
<td>(1/9^{10}, 56%)</td>
<td>(1/5^{13}, 58%) + feedback</td>
<td></td>
</tr>
<tr>
<td>Correct Answer(s)</td>
<td>(1/3^{10})</td>
<td>(1/5^3)</td>
<td>(1/16^{2})</td>
</tr>
</tbody>
</table>

- Student/Problem
  - PRAHE5Y
  - PRAHE5Z
  - PRAHEZ

- Using the Item Report During Class
Immediate Feedback on Classwork and Textbook Homework

Students use their textbook or worksheet

Do their work on paper

Enter their answers into ASSISTments after completing each problem

Students get immediate feedback as to whether they are correct or incorrect

Problem ID: PRABAEPE

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Type your answer below (numeric expression):

\[-9/10\]

Correct!

Submit Answer  Next Problem  Show answer
Skill Practice with Skill Builders

Skill Builders are based on one skill. Students need to answer 3 questions correctly in a row to complete the assignment.

Teachers have access to a report to monitor student progress.

<table>
<thead>
<tr>
<th>Student [Unanonymize]</th>
<th>Status [Show dates]</th>
<th>Days working on assignment</th>
<th>Total time working on assignment</th>
<th>Problems seen</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXXXX</td>
<td>✓</td>
<td>1</td>
<td>00:09:00</td>
<td>3</td>
</tr>
<tr>
<td>XXXXX</td>
<td>× Exceeded daily limit</td>
<td>1</td>
<td>00:12:45</td>
<td>10</td>
</tr>
<tr>
<td>XXXXX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XXXXX</td>
<td>✓</td>
<td>2</td>
<td>00:04:04</td>
<td>3</td>
</tr>
</tbody>
</table>

ASSISTments is not a place where students come and just do work, it is a place where teachers respond to each student's needs.
Can we improve math homework? Presented @SRI_Education @asssistments positive findings at the White House Symposium on Digital Learning today.
Online Mathematics Homework Increases Student Achievement

Jeremy Roschelle
Mingyu Feng
Robert F. Murphy
SRI International
Craig A. Mason
University of Maine

In a randomized field trial with 2,850 seventh-grade mathematics students, we evaluated whether an educational technology intervention increased mathematics learning. Assigning homework is common yet sometimes controversial. Building on prior research on formative assessment and adaptive teaching, we predicted that combining an online homework tool with teacher training could increase learning. The online tool ASSIStments (a) provides timely feedback and hints to students as they do homework and (b) gives teachers timely, organized information about students’ work. To test this prediction, we analyzed data from 43 schools that participated in a random assignment experiment in Maine, a state that provides every seventh-grade student with a laptop to take home. Results showed that the intervention significantly increased student scores on an end-of-the-year standardized mathematics assessment as compared with a control group that continued with existing homework practices. Students with low prior mathematics achievement benefited most. The intervention has potential for wider adoption.

Keywords: computers and learning, effect size, evaluation, experimental design, hierarchical linear modeling, homework, mathematics education, technology
Homework review:
Emphasis on problems that were difficult for students,
Finding 2: Reliable Gain & Meaningful Impact on Student Learning

Existing Methods

ASSISTments

6th 7th

6th 7th

+11 almost 2x +20

TERRANOVA3
Finding 3:
Greater Effect for Low Prior Math: Closed Achievement Gaps!
is not: ALEKS, Cognitive Tutor, IXL, or Khan Academy etc.
What is the future for ASSISTments?

Neil Heffernan
Other languages for Students
Problem ID: PRA95DN

A Physics book slides off the horizontal surface of a rooftop with an initial horizontal speed of 17.10 m/s.
It strikes the floor after 0.80 s.

Ignore air resistance, find the height of the tabletop above the floor.
Set up: Choose down as the positive direction and use g = 9.8 m/s²

Round the answer up to 2 decimal places.
Do not include unit (m)

Type your answer below (mathematical expression):
Submit Answer

---

Assignment: Balancing: simple hydrocarbons, half trick (HS-PS1-7)

Problem ID: PRAZW79

When the following equation is balanced (using the smallest whole number coefficients), what is the sum of all of the coefficients?

\[ \underline{C_{11}H_{22}} + \underline{O_2} \rightarrow \underline{CO_2} + \underline{H_2O} \]

(The hints will show you my steps to balance using the chart method.)

Type your answer below (mathematical expression):
Crowdsourcing Teacher Content and Feedback

Must be Free
80 of students used one of 4 major textbooks

We have a pilot of this idea that was released called TeacherASSIST
A teacher can write feedback
We are working on allowing others teachers to review and possibly adopt
<table>
<thead>
<tr>
<th>Student/Problem ---</th>
<th>PRAHE5Y</th>
<th>PRAHE5Z</th>
<th>PRAHE52</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unanonymize]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Average</td>
<td>27%</td>
<td>61%</td>
<td>84%</td>
</tr>
<tr>
<td>Graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Wrong Answers</td>
<td>1/9^10, 56%</td>
<td>1/5^13, 58%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+feedback</td>
</tr>
<tr>
<td>Correct Answer(s)</td>
<td>1/3^10</td>
<td>1/5^3</td>
<td>1/16^2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xxxxxxxxxx</td>
<td>❄️</td>
<td>❌</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>5^3</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>xxxxxxxxxx</td>
<td>❌</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>1^-10</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>xxxxxxxxxx</td>
<td>❌</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>1/9^10</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Write Feedback that will automatically be given to others.
<table>
<thead>
<tr>
<th>Chapter 1</th>
<th>Chapter 2</th>
<th>Chapter 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>All work</td>
<td>All work</td>
<td>Essay Grading</td>
</tr>
<tr>
<td>32%</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>12:28,83%</td>
<td>feedback</td>
<td></td>
</tr>
</tbody>
</table>

Incorrect Answer:
12:28
Incorrect Message:
This is part to whole. Check the question text and try again.
Writing similar problems
<table>
<thead>
<tr>
<th>Student/Problem --- [Unanonymize]</th>
<th>PRAHE5Y</th>
<th>PRAHE5Z</th>
<th>PRAHE52</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Average Graph</strong></td>
<td>27%</td>
<td>61%</td>
<td>84%</td>
</tr>
<tr>
<td><strong>Common Wrong Answers</strong></td>
<td>1/9^10, 56%</td>
<td>1/5^13, 58% + feedback</td>
<td></td>
</tr>
<tr>
<td><strong>Correct Answer(s)</strong></td>
<td>1/3^10</td>
<td>1/5^3</td>
<td>1/16^2</td>
</tr>
<tr>
<td></td>
<td>🌙</td>
<td>❌</td>
<td>✅</td>
</tr>
<tr>
<td></td>
<td>5^3</td>
<td>0%</td>
<td>1/16^2  100%</td>
</tr>
<tr>
<td></td>
<td>❌</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td></td>
<td>1^-10</td>
<td>0%</td>
<td>1/5^3   100%</td>
</tr>
<tr>
<td></td>
<td>❌</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td></td>
<td>1/9^10  0%</td>
<td>1/5^3   100%</td>
<td>1/16^2  100%</td>
</tr>
</tbody>
</table>

See Similar Problems to assign
80 of students used one of 4 major textbooks Openly Licenses (e.g. Creative Commons) Textbook.

WPI is about to release that we have put all of engaged New York/ Eureka Math in ASSISTments

We also worked with Google so that teachers using Google Classroom can beam it right into their classes stream

We are working on getting funding.
TeachersPayingTeachers.com and BetterLessons.com
All my grantsmanship depends upon it
BostonGlobe Article
Tool Makers
Measurement Expertise
Platform economies of scale
The Reproducibility Crisis
Types of Feedback
Sequencing and Spacing
Self-Regulated Learning & Metacognition
Social Context and Interaction
Assessment
Motivation
Mathematics Education
The Pythagorean Theorem can be used to solve for side $c$. In this problem, the value of $a$ is given as 6 feet and the value of $b$ is given as 22 feet. Plug in the values of $a$ and $b$ into the Pythagorean Theorem and we can solve for $c$.

$$a^2 + b^2 = c^2$$

Try again to answer the main problem above. Remember to round your answer to the nearest tenth place.

After you've watched the video, try again to answer the main problem above. Remember to round your answer to the nearest tenth place.

Figure 10. A comparison of text and video feedback conditions as experienced by students (Ostrow &
Students that have started your study: 329
Students that have completed your study: 251

Bias Assessment
Before analyzing learning outcomes, we suggest first assessing potential bias introduced by your experimental conditions (i.e., examine differential attrition). The table below reports the number of students that have completed your study, split out by experimental condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Started (n)</th>
<th>Completed (n)</th>
<th>Completed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A – Experiment 1</td>
<td>109</td>
<td>80</td>
<td>73.39</td>
</tr>
<tr>
<td>Group B – Experiment 2</td>
<td>87</td>
<td>60</td>
<td>68.97</td>
</tr>
<tr>
<td>Group C – Control</td>
<td>99</td>
<td>89</td>
<td>89.90</td>
</tr>
<tr>
<td>Total</td>
<td>295</td>
<td>229</td>
<td>77.63</td>
</tr>
</tbody>
</table>

NOTE: A significant difference was found between observed and expected completion rates across conditions, $\chi^2 (2, N = 295) = 13.467, p < .01$. This means that a selection effect may have occurred. Hypothesis testing with regard to posttest scores has not been conducted out of an abundance of caution.

Mean and Standard Deviation of Posttest Score by Condition
To examine learning outcomes at posttest, an analysis of means was conducted across conditions. The table below reports mean posttest score and standard deviation for each condition. This information was sourced from our automated posttest sub-report.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Completed (n)</th>
<th>Posttest Score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A – Experiment 1</td>
<td>80</td>
<td>34.40 (4.34)</td>
</tr>
<tr>
<td>Group B – Experiment 2</td>
<td>60</td>
<td>32.95 (3.89)</td>
</tr>
<tr>
<td>Group C – Control</td>
<td>89</td>
<td>44.11 (3.72)</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>37.15 (3.98)</td>
</tr>
</tbody>
</table>

* Presented as Mean (SD).
Providing feedback on computer-based algebra homework in middle-school classrooms

Emily R. Fyfe

Department of Psychology and Human Development, Vanderbilt University, United States
Wisconsin Center for Education Research, University of Wisconsin-Madison, United States

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ABSTRACT
Homework is transforming at a rapid rate with continuous advances in educational technology. Computer-based homework, in particular, is gaining popularity across a range of schools, with little empirical evidence on how to optimize student learning. The current aim was to test the effects of different types of feedback on computer-based homework. In the study, middle school students completed a computer-based pretest, homework assignment, and posttest containing challenging algebraic problems. On the homework assignment, students were assigned to different feedback conditions. In Experiment 1 (N = 183), students received no feedback, correct-answer feedback, or each
Business as usual AT SCHOOL
Get An Account

ASSISTments.org

Classroom.Assistments.org
Arrive at your Dashboard
Find and Assign

ASSISTments Certified

Mathematics

- Skill Builders (students must answer 3 problems correctly in a row to complete each set)
- Problem Solving (students must answer every problem to complete each set)
- EngageNY/Eureka Math (Great Minds)
- Textbooks (problems directly reference textbook questions)
- Enrichment (problems contain links to external math sites)
- Smarter Than a 5th Grader
Go to the Builder tab and write your own questions

Cristina add screen shot of the builder
Drop in the video of what is assistments with the thumping beat
Jeff has a marble jar, that he likes to randomly select marbles from it to play with.

The jar has 6 orange marbles, and 9 purple marbles.

What is the probability that Jeff gets an orange marble from the jar?
### Look At Data

#### Assignment: Problem Features

<table>
<thead>
<tr>
<th>Student/Problem</th>
<th>Average Data driven</th>
<th>Data driven</th>
<th>PRA2D9W</th>
<th>PRADVP4</th>
<th>PRA2T9W</th>
<th>PRA2ADE</th>
<th>Total Hints</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Average</td>
<td>45%</td>
<td>42%</td>
<td>78%</td>
<td>28%</td>
<td>56%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Wrong Answers</td>
<td>6/9, 60%</td>
<td>2/3, 20%</td>
<td>C. decreased combustion of fossil fuels, 63%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct Answer(s)</td>
<td>0.4</td>
<td>B. decreased use of atmospheric CO2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| XXXXXXXX | 33% | x | v | B. decreased use of atmospheric CO2 | 100% | | | 0 | 00:03:35 |
| XXXXXXXX | 69% | .4 | 100% | B. decreased use of atmospheric CO2 | 100% | | Hint requested | 0% | 0 | 00:04:15 |
| XXXXXXXX | 67% | .6/15 | 100% | B. decreased use of atmospheric CO2 | 100% | | | | |

[3 / 4]

They needed tax revenue because of debts accrued during the French and Indian War. The British erred by not giving the colonists any voice in the taxes and being inflexible when colonists objected. 75% (Ungraded)

England needed to implement the stamp act because of the debt accumulated during the war. I forgot to listen to the rest of the video for the mistakes. 2
4 Steps to Successful Implementation

1. **Start Small** – pick one thing and learn to do it well

2. **Be Consistent** - use the site on a scheduled basis or with specific assignments

3. **Hold Students Accountable** for all of their work completed on ASSISTments

4. **Expect to Tweak** what you are currently doing since report viewing should become a daily routine
Expect a bit of a roller coaster ride
What to Expect

New types of assignments on Classroom

The reports are great. I like knowing how they did immediately.

I like knowing immediately if I am correct.

Students are complaining!! I need to explain the benefits of immediate feedback.

Teaching is busy. I wasn’t able to build that assignment on ASSISTments.

What? You didn’t assign this using ASSISTments? But how do I know if I answered correctly?

Arrgh!! I have to answer correctly to complete this!!

New content to assign.
<table>
<thead>
<tr>
<th>Question</th>
<th>Of the 66 Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you often feel <strong>frustrated</strong> when using ASSISTments?</td>
<td>56% said “yes”</td>
</tr>
<tr>
<td>Does it take <strong>longer</strong> to do your homework when using ASSISTments?</td>
<td>66% said “yes”</td>
</tr>
<tr>
<td>Do you feel your <strong>time is better spent</strong> when using ASSISTments to do your homework?</td>
<td>73% said “yes”</td>
</tr>
<tr>
<td><strong>Do you feel you learn more</strong> when doing your homework on ASSISTments?</td>
<td>84% said “yes”</td>
</tr>
<tr>
<td>Do you <strong>prefer</strong> to do your homework on ASSISTments or a worksheet?</td>
<td>86% said “yes”</td>
</tr>
</tbody>
</table>
Thank you

www.assistments.org

Assistments@wpi.edu