Designing Professional Development for Teachers Using Math Instructional Video Games in the Classroom

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Participant Outcomes

- Understand the importance of professional development for teachers using technology
- Receive information on how to more effectively design professional development for teachers using technology
- Hear about a professional development implemented for 6th-grade math teachers
State of Professional Development on Technology and Technology Use in Classrooms
PD Related to Technology
(Schools and Staffing Survey, 2007-2008; NEA, 2008)

• National survey data

✓ 34% participated in PD on technology in past 12 months

❖ 40% rate as “useful” or “very useful”

✓ Rate training for administrative or communications purposes higher than training for using technology directly with students
Uses of Technology in Classroom  
(NEA, 2008)

- Daily to monitor student progress (41%)
- For research and information (37%)
- To instruct students (32%)
- To plan and prepare instruction (29%)
Barriers to Technology Use  (Kopcha, 2012)

- Access (perceived or real)
- Administrative vision
- Beliefs about usefulness and/or difficulty
- Time
- Professional development
Designing Effective Professional Development
Recommendation From Professional Development Literature

• Focus on:
  ✓ a particular subject area
  ✓ a limited number of teaching practices

• Allow teachers the opportunity to engage in learning instead of passively receiving

• Involve communities of teachers

• Long-term for student learning gains
Special Considerations with Technology PD

- Access to technology
- Money
- Time
- Teacher comfort with technology/computer lab
- Reason(s) for using technology
Our Professional Development
CATS Project Goal

- Develop and evaluate video games aimed at improving students’ knowledge and skills in pre-algebra topics
  - Focus on rational numbers, solving equations, functions
  - Develop and test games
  - Efficacy Trial #1: Examine game use in supervised settings (e.g., classroom)--game usage today
  - Efficacy Trial #2: Examine game use in less supervised settings (e.g., afterschool)--game usage tomorrow
CRESST Video Games
Our Professional Development

• Purpose: To prepare teachers to use games with students

• Focus:
  ✓ Play all games
  ✓ Review math concepts and student common errors
  ✓ Link games and classroom instruction
  ✓ Logistics of study
Video Game Study Teachers

- 62 teachers
  - 32 fractions
  - 30 solving equations
- 25 schools in 9 districts
- California and Nevada
- 2 groups of teachers (fractions games and solving equations games)
## Number of Years Teaching

<table>
<thead>
<tr>
<th></th>
<th>Fractions Teachers</th>
<th>Solving Equations Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>14.16 (7.63)</td>
<td>12.13 (5.99)</td>
</tr>
<tr>
<td>6th grade math</td>
<td>7.27 (5.15)</td>
<td>6.45 (5.95)</td>
</tr>
<tr>
<td>Pre-algebra</td>
<td>4.00 (3.98)</td>
<td>6.22 (4.89)</td>
</tr>
<tr>
<td>Algebra</td>
<td>2.57 (2.57)</td>
<td>4.50 (5.39)</td>
</tr>
</tbody>
</table>
### Teaching Certificates and Degrees

- Most teachers had limited formal training in mathematics

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Fractions Teachers</th>
<th>Solving Equations Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math teaching credential/certificate</td>
<td>9%</td>
<td>3%</td>
</tr>
<tr>
<td>Math undergraduate major</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>Math-related Master’s</td>
<td>6%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Professional Development Design

- Teachers pre-assigned to condition
- Evenings and weekends
- One four-hour session
  - Teachers given binder with PD content
  - Facilitators demonstrated how to introduce games to students
  - Teachers played all games/discussion
  - Administered survey
Professional Development Survey

- Over 90% of teachers claimed to be prepared or very prepared to:
  - give students instruction on the games
  - help students who have trouble with the games
  - explain math in the games
  - connect the games to classroom instruction
  - manage the classroom during game play
  - fill out teacher logs
Post-Study Teacher Survey

- Playing games was essential part of PD: 96-100% agree or strongly agree

<table>
<thead>
<tr>
<th>The PD helped me understand…</th>
<th>Fractions Teachers</th>
<th>Solving Equations Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>the key math ideas</td>
<td>89%</td>
<td>80%</td>
</tr>
<tr>
<td>student misconceptions that might show up in games</td>
<td>78%</td>
<td>72%</td>
</tr>
<tr>
<td>link of games to math instruction</td>
<td>66%</td>
<td>52%</td>
</tr>
</tbody>
</table>
Would use games again in classroom
Students "engaged in almost every game"
At least two games "helped students learn"

Proportion Agreed

Teachers’ Perceptions

Proportion Agreed

"I would have liked to play longer" at least two games
"I really got into" at least two games
"I learned from" at least two games

Students’ Perceptions
9. Please briefly describe.
I was pleasantly surprised to see the level of engagement of my students to the games. They were really into them. They tutored each other and were constantly asking when they'd play next.

10. Overall, how helpful do you think the games were in helping students learn math concepts?

☐ Not helpful at all  ☐ A little helpful  ☐ Helpful  ☒ Very helpful

9. Please briefly describe.
Even though they struggled with some concepts, students were willing to keep trying so they could progress in the games—much different than if they were simply working problems on paper.

10. Overall, how helpful do you think the games were in helping students learn math concepts?

☐ Not helpful at all  ☐ A little helpful  ☐ Helpful  ☒ Very helpful

9. Please briefly describe.
Students who do not necessarily perform high in class shined while playing. Interesting.