Repurposing iPads and Apps to Teach Science

Moving Beyond Drill and Practice

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Background - Teachers and Technology

- Teachers need confidence, knowledge, and experience with technology (Kim et al., 2013).
- Teachers rely heavily on their past experiences, beliefs, and attitudes about teaching and learning (Mueller et al., 2008).
Background - Teachers, Technology, & Professional Development

- Teachers need support for technology integration (Looi et al., 2009; Prieto et al., 2011).
- Current PD tends to occur at single time points, often with little to no follow up with the teacher in their classroom.
Current Study

• Utilized a 1-1 coaching & modeling structure for Professional Development
  – with multiple interactions with teachers over one school year
Research Question

How does exposure to and training of teachers to integrate apps for core disciplinary instruction change (or not change) teachers’ instructional design and implementation in 1:1 iPad classrooms?
Methodological Framework - Design-Based Research (DBR)

(Foster, 2014)
Theoretical Framework - *Technological Pedagogical Content Knowledge* (TPACK) Framework

Mishra and Koehler (2006)
Theoretical Framework – Replacement – Amplification – Transformation Framework

Replacement

• Technology serves merely as a different means to the same instructional end.

Amplification

• Technology increases efficiency and productivity without fundamental change.

Transformation

• Technology allows forms of instruction and learning that were previously inconceivable.

Hughes (2006)
Theoretical Framework - Knowledge Building Framework

(Scardamalia & Bereiter, 2014)

- Provided inspiration for the development of the co-designed technology integrated lessons.
- Knowledge building argues that technology-mediated building and sharing of collaborative knowledge advances group and individual development.
Study Context

- School – Middle School
  - Title 1 school, majority minority student population
  - 1 to 1 iPad initiative
- Teachers
  - 3 science teachers
  - One 8th grade & two 6th grade teachers
Professional Development

• Summer
  – Multi-day
  – Volunteer basis
  – Across content areas

• Coaching
  – Individual PD
  – Co-designing, check-ins, debriefing sessions
Data Sources

- Interviews
- Lesson Plans
- Transcripts
- Field Notes and Observations

Allowed for triangulation of data
Data Analysis

Core Codes or Themes

Axial or Theoretical Codes

Open Coding
Operational Definitions

Teachers Perceptions of Technology

Used as a tool

Hindrance to instruction

Technology tool
Magic fix
Instruction

Inter-rater Reliability = 0.95
Results - Teachers’ Initial use of iPads

• Quizzing or drilling students on previously taught material
• Replacement for traditional worksheets
• Utilize programs that are familiar (i.e. Microsoft Word, PowerPoint, Excel)
• Teacher-centered, didactic instruction
“The technology I use here [in math class] is skill based. I use Cahoot, which is this little game we play and they [the students] play it off their iPads as I display it on the screen. I use it at least once or twice a week, because that keeps, sort of drilling them with material, which gives them [the students] another look at the material.”

- Jillian 8th grade math teacher
School Culture - Emphasis on Testing

- Administrative focus on improving test scores
- Teachers noted limited time for inquiry use of technology due to the focus on testing
Three Case Studies

Patricia
6th Grade Science

Gary
6th Grade Science

Marylyn
8th Grade Science
Gary

• 3 co-designed inquiry units
  – *Sound*
  – *Plate Tectonics*
  – *Ecosystem*

• Initiated coaching and designing sessions

• Moved towards more constructivist pedagogical practices

• Transitioned from majority Replacement activities to Amplified activities
Marylyn

- 2 co-designed lessons
  - Health, Pathogens and Disease
  - Water Quality
- Maintained teacher-centered, didactic use of technology (i.e. display lecture notes on smartboard)
- Classroom Management focus
The mitochondrion is a double membrane-bound organelle that is primarily responsible for metabolizing sugars and fats to provide usable ATP, which is the main energy source for the majority of cellular functions.
Patricia

- No co-designed lessons
- Only wanted to use the iPads after she had taught the content to her students.
- Consistent use of iPads for drilling students on practice test questions.
Discussion of Findings

• Using technology for inquiry requires teachers to evaluate their current pedagogical practice.
• Teachers also need successful experiences with technology before they attempt to integrate it into their classroom.
Discussion of Findings

• Teachers incorporate technology at different rates.
• Confounding factors influence teacher technology use.
• Personal experience is key for teacher adoption.
Contribution to the Literature

- Teachers’ internal barriers with technology continue to be an integral part as to why teachers do not utilize technology for inquiry lessons
- Personal experience is valuable
Future Goals

• To continue to aid teachers in developing technology enhanced science inquiries.

• To co-design science inquiries that teachers in assessment focused schools can implement that are more than drilling students on previous taught topics.
Thank You!

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