Integrating Computing Across the Curriculum

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Introduction

The goal of *Integrating Computing Across the Curriculum (ICAC), a* 60 month multi-method, multi-disciplinary project, is to develop and test a program to increase the number of students in the Science, Technology, Engineering, and Math (STEM) pipeline by providing teachers and students with curriculum training and skills to enhance STEM education in elementary schools. Specifically, ICAC will increase computer proficiency, science and mathematic skills of 4th and 5th grade students and teachers, and inform parents about the opportunities in STEM careers.

Background

- Since 1995, concerns about the "digital divides" in technology usage have increased
- Students in poor, urban areas have lower levels of technology usage than those from more affluent areas
- Individuals who lack technological skills will be less likely to fully participate in society
- Students lacking technological skills will also be less likely to take advantage of the academic and future employment opportunities technology can offer

Context

- Plan to decrease the digital divide in Birmingham and prepare children for the future
- The City of Birmingham spent $3 million to purchase 15,000 XO laptops, which were distributed to students and schools
- Minimal training on how to use the XO laptops was provided to teachers and staff

Characteristics of Birmingham City School (BCS) District

- > 97% African American students
- High poverty school district – 82% free/reduced lunch
- 10,497 students in 1st – 5th grades
- 30 elementary schools

Goals and Specific Aims of Project

1. Conduct a formative assessment with teachers to determine the optimal intervention to ensure productive school, principal, teacher, and student participation
2. Implement a structured intervention aimed at teachers, students, and families that will enhance the students' understanding of STEM fundamentals by incorporating laptops into an inquiry-based educational process
3. Assess the effects of ICAC on student STEM engagement and performance, teacher and student computing specific confidence and utilization, student interest in technology and STEM careers, and parents' attitudes toward STEM careers and use of computers

Methodology

Design

- Multi-phase intervention, scaling up over time
  - Year 1: 2 pilot schools
  - Year 2: 6 new schools (2010 – 2011)
  - Years 3 – 4: 10 new schools per year
- Activities:
  - Professional development sessions
  - In-class observation and support activities
  - Teacher institutes and student workshops each summer
  - Lesson plan development and dissemination
  - Administrator meetings
  - Yearly showcase event, Scratch Day
  - Teacher, student, and parent surveys to assess ICAC impacts
  - Observation and field notes from professional development activities

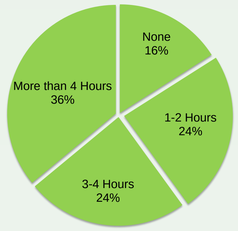
Participants (to date)

	Year 1	Year 2
# Schools	2	6
# Teachers	22	41
# Students	460	792

Results: Teacher Institutes

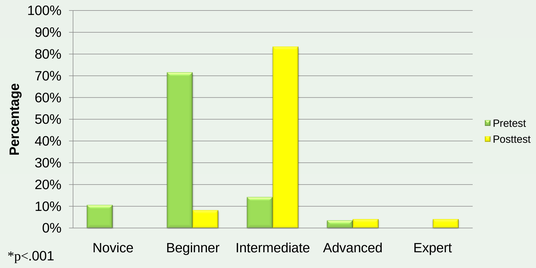
XO Training, Skill, and Comfort Levels

Figure 1. Hours of Prior XO Training



- 16% of teachers reported no prior XO training.
- Slightly more than a third of teachers reported having more than 4 hours of prior XO training.

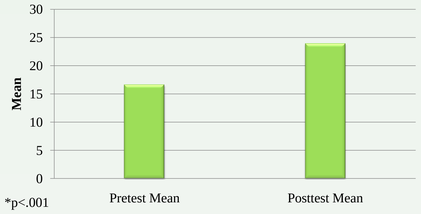
Figure 2. Self-Rated XO Skill Level*



*p<.001

- Self-rated XO skill level increased significantly after teachers participated in the *Teacher Institutes.*
- In the posttest survey most teachers rated themselves as having a skill level of intermediate or above.

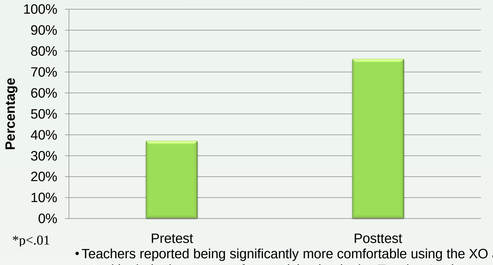
Figure 3. Change in Comfort of Using Various Features of the XO Scale*



*p<.001

- Teachers' comfort levels in using features of the XO laptops increased significantly between pre and posttest surveys.

Figure 4. Change in Comfort Levels of Using the XO as a Tool in the Classroom*

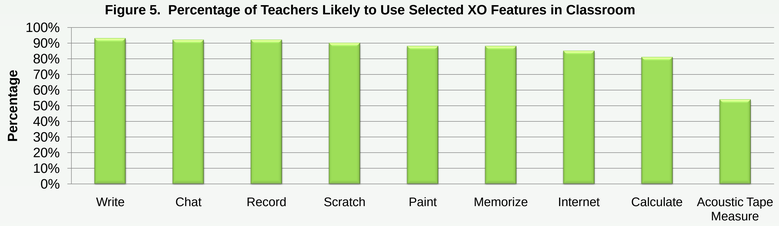


*p<.01

- Teachers reported being significantly more comfortable using the XO as a tool in their classrooms after participating in the *Teacher Institutes.*

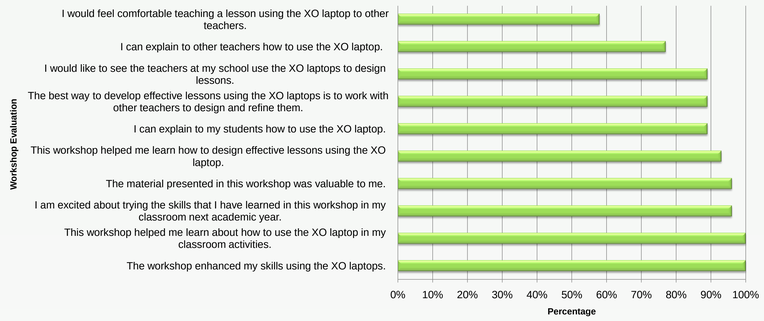
The XO in the Classroom and Workshop Impact

Figure 5. Percentage of Teachers Likely to Use Selected XO Features in Classroom



- 90% or more of teachers surveyed at the end of the *Teacher Institutes* stated they were likely to use the Write, Chat, Record, and Scratch activities in their classroom.
- Over 50% or more of teachers stated they would likely use each of the listed XO activities in their classroom.

Figure 6. Percentage of Teachers Agreeing With Evaluative Statements Regarding the Workshop



- 100% of teachers who participated in the *Teacher Institutes* agreed that the workshop enhanced their XO skills and provided them with ways to use the XO in their classroom.
- More than 90% of teachers reported having learned how to design effective lessons using XO laptops and being excited about trying the skills learned in the *Teacher* Institutes in their classrooms during the 2010-2011 academic year.
- Over 50% of the teachers who participated in the workshop agreed that after the workshop they would feel comfortable teaching other teachers to use the XO laptops.

Conclusions

Selected Successes To Date

- Over 150 hours of classroom observation, Year 1
- 52 lesson plans created and revised
- 29 teachers participated in *Teacher Institutes,* Summer 2010
- 36 students participated in student summer camps, Summer 2010
- 743 students surveyed (94% of Year 2 students), Fall 2010
- Multiple professional development and in-class sessions held
- Much more positive attitude towards XOs and ICAC in Year 2

Study Challenges

- Recruiting students for summer camps, Summer 2010
- Change in Birmingham City School administrators
- Communication with school system
- School scheduling and schedule revisions for professional development and in-class sessions
- Teacher buy-in at one Year 2 school
- Issues with XOs in need of repair
- Future funding for XOs remains unknown

Next Steps

- Continue in-class support and professional development sessions with teachers
- Meeting with administrators
- Lesson plan distribution
- Continue website development
- Planning and preparation for Scratch Day
- Posttest surveying, spring 2011
- Planning, preparation, and recruitment for summer *Teacher Institutes* and student camps
- Data analysis, presentations, and manuscript development

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