# Effects of a K-12 technology integration program on teachers and students

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## Abstract

IMPACT is a media and technology program designed to support and promote effective instruction through the integration of technology. The model is currently being implemented in 30 K-12 schools throughout North Carolina. This evaluation study investigated the effects of this model on the attitudes, behaviors, and activities of students and teachers. Information about the measures, data collection/analysis methods and implementation issues will be addressed.

## Objective

The objective of this study was to evaluate the longitudinal effects of a large-scale technology integration model on student and teacher outcomes, including student achievement and technology skills, teacher use of technology during instruction, and instructional activities.

## Perspectives

Numerous studies have suggested that access to technology in the classroom is associated with higher student achievement (Christmann, 1997; Mann & Shafer, 1997; Page, 2002; Wenglinsky, 1998). However, these effects differ across studies and across populations and subject areas (e.g., Heineke, Blasi, Milman, Washington, 1999). Few studies have investigated the effects of a comprehensive technology integration model, but available data indicate that such models hold more promise for improving academic achievement (e.g., Mann, Shakeshaft, Becker, & Kottkamp, 1998). According to ISTE, a number of conditions are essential to create learning environments in which technology may be integrated successfully; these include administrative support and vision, student-centered approaches to learning, access to contemporary technologies, technical assistance for maintaining and using technologies, and ongoing financial support for sustained technology use (ISTE, 2007). Similarly, teachers' effective use of technology in the classroom is associated with a number of factors: appropriate staff development, opportunities for collaboration with colleagues, modeling of best practice (Burns, 2002), and institutional support (Darling-Hammond & McLaughlin, 1995; Guskey & Sparks, 1996). Reflecting these standards, the IMPACT model (NC DPI, 2008) provides an innovative framework for infusing technology and media resources into instructional programs, focusing on the collaboration among teachers and technology and media personnel, as well as appropriate and sustained staff development and support.

The IMPACT program follows the guidelines for outstanding media and technology programs included in the state's Educational Technology Plan. This model is also aligned to Information Power: Building Powerful Partnerships, the national standards for media and technology programs. In addition, the staff development provided to school personnel through



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this model is based on the NSDC Standards for Professional Development, which are based on research that demonstrates the link between staff development and student learning (Hirsh, 2006). A primary goal of this project is to produce technologically literate students, consistent with the TAAP report, which states that students should have a broad perspective on the uses, variations, and purposes for technology use (TAAP, 1996).

The IMPACT model for technology integration has, at its core, collaboration between teachers in conjunction with the technology facilitator and media coordinator. This collaboration emphasizes the best uses of technology and media collections matched to content standards with the goal of improved student achievement. The model promotes school leadership that includes the principal, technology facilitator, and media coordinator, fostering a collaborative environment for all stakeholders. The IMPACT Model also requires schools to offer flexible access to media/technology resources, also referred to as "flexible scheduling." Professional development was a required component, though the format was left up to individual schools. In addition, all IMPACT schools were expected to hire a full-time technology facilitator (TF) to lead the integration of instructional technology in the school. For more information about the model's components, see http://www.ncwiseowl.org/impact/

## Methods

The primary goal of the IMPACT evaluation was to measure whether the implementation of the IMPACT model makes a significant difference in student achievement. Given the encompassing nature of the IMPACT framework, we anticipated that this model would also affect other student and teacher outcomes. The following discussion describes the population, study design, and measures used to assess a selection of the variables studied in the IMPACT evaluation from 2003-2009.

### *Population*

All IMPACT schools are Title I (low SES) sites; 25% are located in urban districts, with the others located in rural areas. The IMPACT I cohort (2003-06) included 11 schools, including grades K-8. The IMPACT II cohort (2007-09) included 5 middle schools. In July 2008, funds were awarded to 7 additional school districts, including 30 schools (elementary, middle and high) that have a high percentage of economically disadvantaged students. Three of the school districts participating in the 2006-07 IMPACTing Leadership training received funding in July 2008 as the IMPACT III cohort. Four additional school districts were selected through a competitive RFP process that took place in Fall 2007; they received funding in July 2008 as the IMPACT IV cohort. A unique feature of the third and fourth cohorts is the district's role in planning and implementation. In these latter cohorts, applications were accepted from districts, as opposed to individual schools, with the district applicants planning to implement the IMPACT model at most/all schools within their district.

*Design and Data Sources*

A quasi-experimental (matched subjects) longitudinal design was used to assess the effects of the model for the IMPACT I and IMPACT II cohorts. Analysis of Variance, Logistic Regression, as well as hierarchical linear modeling (HLM) techniques were used to assess changes in teacher and student variables over time. The evaluation design was multivariate, assessing an extensive number of variables across multiple levels (teacher, student, administrator, school). The following discussion describes selected measures used to assess some of these variables.

Changes in teachers' technology use and skills were evaluated with a survey based on the NETS-T standards (Altec, 2001; ISTE, 2002). This survey assesses six constructs, including Technology Operations and Concepts (10 items), Planning and Designing Learning Environments and Experiences (8 items), Teaching, Learning, and the Curriculum (6 items), Assessment and Evaluation (6 items), Productivity and Professional Practice (7 items), and Social, Ethical, Legal, and Human Issues (11 items) (Corbell, Osborne, & Grable, 2008). Each item begins with the prompt "In your experience as a teacher do you…," and is answered via a four-point Likert-scale ranging from 0-*Not at all*; 1- *Minimally* (need help); 2- *confidently* (knowledgeable and fluent); and 3- *Able to teach others*. Confirmatory factor analyses (Corbell, Osborne, & Grable, 2008) have determined that the 48 survey items could be analyzed according to the six-factor model (all $\alpha > 0.93$), or in a simpler single-factor model.

Teachers' instructional activities were measured using a self-report questionnaire, Teacher Activities of Instruction (AOI) (Grable & Park, 2002). Adapted from a survey used in the NSF Systemic Change Initiative (Horizon Research, 1996), this questionnaire was used to measure classroom activities used during a specified four-week period of the spring semester, based on the argument that when teachers have the opportunity to reference their lesson plans, self-report data about their instructional activities has a higher degree of accuracy (Davidson, 2000; Grable & Park, 2002). Items addressing a wide range of possible classroom activities were included in order to gauge constructivist practices in the classroom, one tenet of the IMPACT model. Responses for frequency of use range from 0-"*never*" to 5-"*almost every day*." Confirmatory factor analyses determined that a 20-item subgroup of these items was the best factor solution for the survey; this single factor was stable across teacher populations from different school levels (all $\alpha > .93$) (Grable, Overbay, Seaton, Shattuck, & Osborne, 2008). Within the context of the IMPACT evaluation, items addressing computer use were added as a separate section on the survey ($\alpha = .80$).

The quality of the professional development was assessed using the Standards Assessment Inventory developed by the National Staff Development Council (SEDL,2003). This inventory was administered to all school staff in April 2009 and 2010, and addresses twelve



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standards, combined into three key categories (Context, Process and Content) found to be essential to effective professional development (Hirsch, 2006).

Students' technological literacy was measured with a Technological Skills checklist administered to all IMPACT students. The Technology Skills Checklist (TSC) was originally designed by Berkeley Planning Associates in conjunction with the Teacher Led Technology Challenge project (Berkeley Planning Associates, 1998). This survey measures a number of variables, but prominently features a set of items (32 items on the grades 6-8 version, and 27 Items on the 3-5 version) that address students' perception of their technology skills. The five-point scale includes the following responses: 1-"*I do not know if I have done this*," 2-"*I have never done this*," 3-"*I can do this with some help*," 4-"*I can do this by myself*," and 5-"*I can show someone how to do this*." Confirmatory factor analyses indicated that for the TSC 6-8, a four-factor model provided the best fit for the data: File maintenance ($\alpha = 0.89$), Database operations ($\alpha = 0.89$), Basic technology skills ($\alpha = 0.88$), and Advanced technology skills ($\alpha = 0.91$). On the TSC 3-5, a three-factor model provided the best fit for the data: File maintenance ($\alpha = .82$), Basic computing skills ($\alpha = .83$), and Advanced technology skills ($\alpha = .80$).

Student achievement was assessed using standardized state-administered assessments for North Carolina, which include End-of-Grade tests in grades 3-8, and End-of-Course tests in grades 9-12, both of which are criterion-referenced tests. More information about the development, scoring, and administration of these tests can be found at http://www.ncpublicschools.org/accountability/

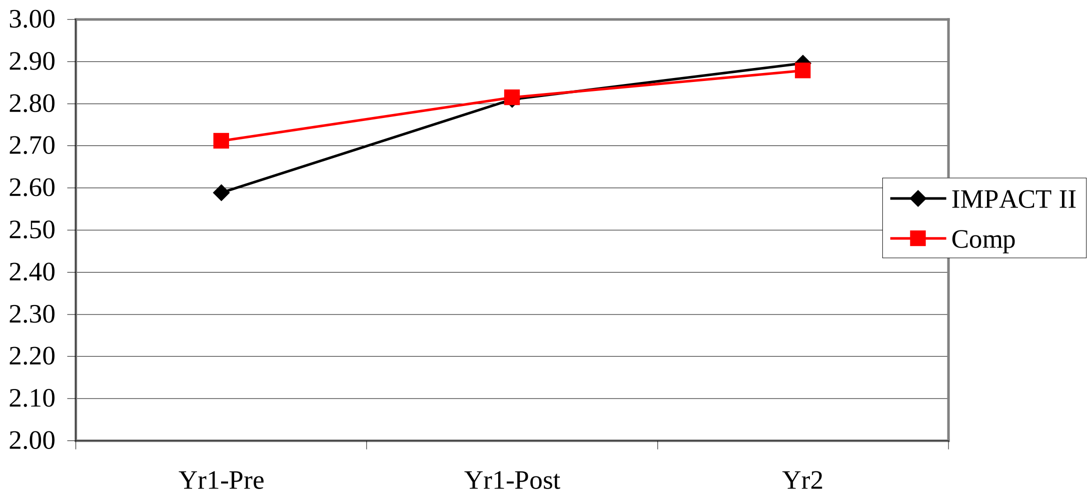
## Results

Where possible, the discussion of survey results focuses on results from IMPACT I and II, cohorts in which Comparison students and teachers completed surveys, as the ability to examine within and between-subject differences over time provides more information about the comparative effects associated with the model. Student achievement is discussed within the context of the IMPACT III/IV evaluations, as these cohorts were larger and more comprehensive (including high schools), and provide more information about the effects associated with the model in its most current iteration, the district-wide approach.

### *Teachers' Technology Skills (NETS-T)*

Results from all four cohorts of the IMPACT evaluation indicated that teachers made significant growth over time in their perception of their technology skills. Over the initial 2-3 years of implementation, survey results from all cohorts showed significant growth in teachers' confidence in their ability to implement the National Educational Technology Standards, as measured by the NETS-T survey. In the IMPACT I study (2003-2006), HLM analyses indicated that IMPACT I teachers started the project significantly less confident about their skills than Comparison teachers, but showed significant and substantial growth in their self-perceived technology proficiency, whereas there was no significant growth in Comparison school teachers' self-perceived technology proficiency ($p$ for IMPACT < .0001, for IMPACT * time < .0001). In IMPACT II (2007-2009), repeat-measures Analysis of Variance results indicated a small but statistically significant effect for the interaction between time and group, indicating that the IMPACT II teachers made significantly greater improvement in their self-reported technology skills, relative to Comparison teachers (m$F_{(2,213)}$ =4.09, p<.05, eta$^2$=.04). Figure 1 provides a graphical illustration of these data. As this figure shows, IMPACT II teachers began the project with significantly lower NETS-T scores, but by Year 2 of the implementation process had pulled even with Comparison teachers; their current trajectory indicates that IMPACT II teachers' perceived technology skills are following a trend similar to the one experienced by IMPACT I teachers in the initial iteration of the model.

Figure 1. *IMPACT II teachers' NETS-T skill scores, Year 1-Year 2*

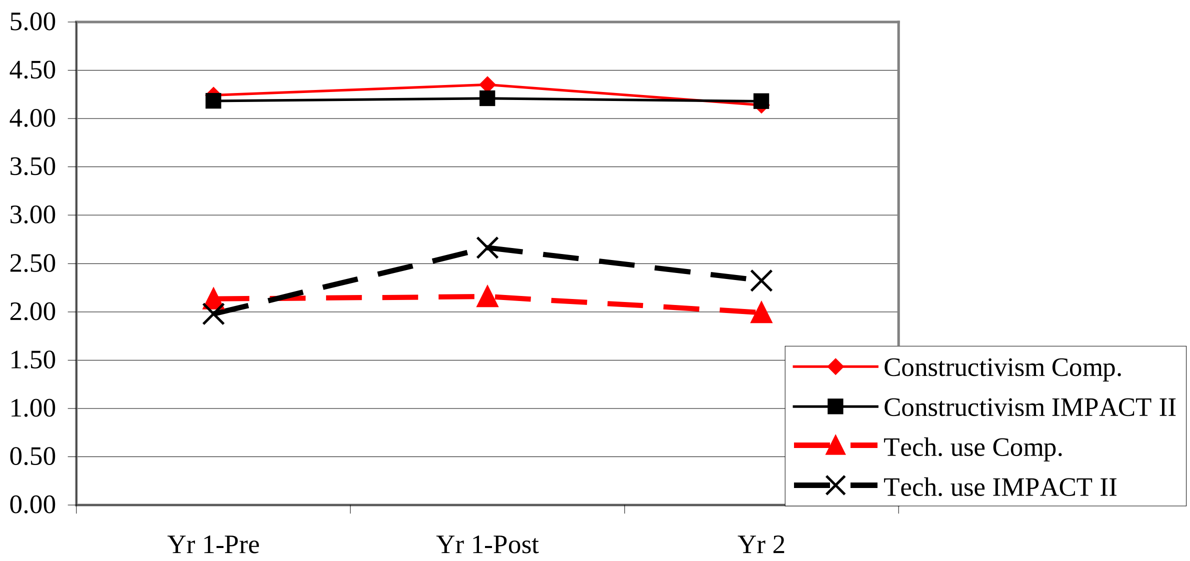



*Activities of Instruction (AOI)*

One aspect of the IMPACT evaluation involves examining the types of instructional approaches used within a technology-rich environment. In particular, evaluators have been interested in changes in the use of constructivist approaches reported by classroom teachers. Results for the AOI Constructivism scale indicated that there was a small but significant effect for time*group (m$F_{(2,187)}$ =3.29, p<.05, eta$^2$=.03); this effect was largely due to the decline in the level of constructivism reported by Comparison teachers between Year 1 (post) and Year 2 (post); overall, the level of constructivism reported by IMPACT II teachers remained essentially stable.

There was a much larger effect for technology use; IMPACT II teachers made significantly greater strides in their reported use of technology, relative to Comparison teachers, whose reported use of technology declined during the project (m$F_{(2,195)}$ =14.64, p<.0001, eta$^2$=.13). Figure 2 provides a graphical illustration of these results. Interestingly, IMPACT II teachers reported a slight decline in the frequency of technology use in the classroom in Year 2; because access to technology and exposure to professional development (key elements of the model) continued to increase in Year 2, this finding may reflect IMPACT II teachers' willingness to make judgments about (in)appropriate uses of technology to enhance instruction.

*Figure 2. IMPACT II teachers' Activities of Instruction (AOI) scores, Year 1-Year 2*




*NSDC's Standards Assessment Inventory (SAI)*

The SAI was administered to all IMPACT III/IV schools in Spring 2009[1], in an effort to measure the prevalence/intensity of practices found to be indicative of high quality professional development programs, and reflective of the twelve standards for staff development outlined by the NSDC, which are used as a basis for the North Carolina Standards for Professional Development. Results from analyses of IMPACT III/IV schools were consistent with results obtained from the larger national dataset used in the factor analysis (N=51,000), in that, average ratings for each factor differed significantly from each other within both of the IMPACT cohorts. In fact, significant differences were noted between all pairs of factors at the .001 level, with the exception of the School Leadership/Equity pair within the IMPACT IV cohort, in which no significant difference was observed (*p*=.235).

[1] The SAI was not administered to the IMPACT I or II cohorts.

Table 1. *Standards Assessment Inventory (SAI). Average Ratings by Factor (Scale of 0-4)*

| IMPACT Model /Factor | N | Mean | SD |
|---|---|---|---|
| IMPACT III | | | |
| Opportunities for PD/ Teacher Collaboration | 484 | 2.84 | .72 |
| School Leadership | 484 | 3.09 | .68 |
| Equity | 484 | 3.20 | .58 |
| Teacher Influence on Decisions/Policy | 484 | 2.59 | .77 |
| IMPACT IV | | | |
| Opportunities for PD/ Teacher Collaboration | 553 | 2.91 | .68 |
| School Leadership | 553 | 3.15 | .69 |
| Equity | 553 | 3.17 | .57 |
| Teacher Influence on Decisions/Policy | 553 | 2.62 | .80 |

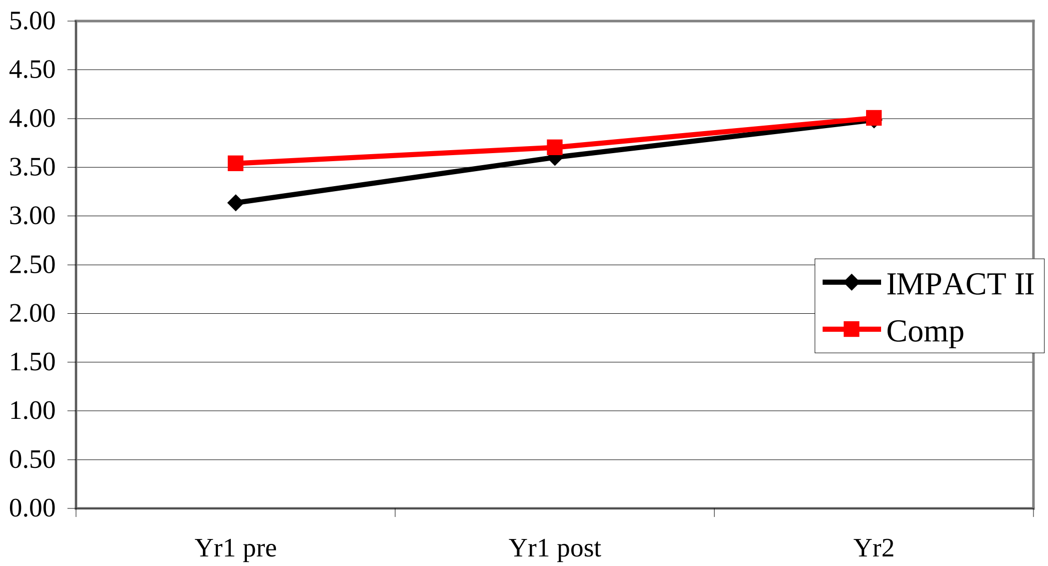
It is important to note that average ratings for the School Leadership and Equity factors were significantly higher than those for the other two factors. Again, this is consistent with the previously cited technical report, which included a sample of over 51,000 teachers in four other states, thus indicating our results are reflective of a more widespread phenomenon, extending beyond the schools in this project. These authors suggest that "the kind of job-embedded collaborative learning that has been found to be important in promoting instructional improvement and student achievement is not a common feature of professional development across many schools. In addition, teachers' lack of influence over school decisions means that teachers are less likely to be engaged in collaborative problem-solving around school-specific issues" (p.55).

However, other findings that emerged from the SAI indicated that 37% of teachers in the IMPACT III and IV cohorts reported they frequently/always observe each other's classroom instruction as one way to improve teaching, and 54% reported they frequently/always received feedback from colleagues about classroom practices. Of those surveyed, 79% said teacher learning was frequently/always supported through a combination of strategies (e.g. workshops, peer coaching, study groups, joint planning of lessons, and examination of student work). Further, 67% reported they frequently/always receive support implementing new skills until they become a natural part of instruction, and 49% said they frequently/always get to choose the kind of professional development they receive.

*Student Technology Skills: Tech Skills Checklist (TSC)*

Results from the IMPACT I study indicated that IMPACT I students in grades 3-5 experienced stronger growth in their perceived technology skills, but there was not a significant difference in the amount of growth on this variable for students in grades 6-8; IMPACT I middle school students had slightly higher average scores on this variable, but did not experience a significantly different growth pattern, relative to Comparison students. In the IMPACT II project, a somewhat different pattern was observed. Results from the TSC 6-8 survey administered to IMPACT II middle school students and their Comparison counterparts indicated that Comparison students had higher average perceptions of their technology skills at all 3 timepoints measured. However, the interaction between time*group was significant; IMPACT II students experienced more growth on this variable over time ($mF_{(8,2408)} = 11.40$, $p < .0001$, $eta^2 = .01$). This effect was strongest for the "Database" factor ($F_{(2,320)} = 35.28$, $p < .0001$, $eta^2 = .02$); these results are illustrated in the figure below.

*Figure 3. IMPACT II students' TSC 6-8: "Database" factor scores, Year 1-Year 2*




*Student Achievement: EOG/EOC Test Scores*

The findings from IMPACT I demonstrated a significant association between implementation of the IMPACT Model and student achievement; IMPACT I students experienced stronger growth on Reading and Math scale scores, and were more likely to move from failing to passing on their state-administered End-of-Grade tests (Overbay, Osborne, Seaton, Vasu, & Grable, 2007). IMPACT II schools, have not shown the same pattern, to date, although analyses of the current school year's test data are pending (Overbay & Vasu, 2010). The IMPACT III and IV cohorts are larger and more comprehensive in scope than either the IMPACT I or II cohorts; the following discussion describes selected findings associated with these two iterations of the IMPACT model.

*IMPACT III: Student achievement results*

There were 7,244 students included in these analyses who took an End-of-Grade test while enrolled at an IMPACT III or matched Comparison school in 2009. The groups included 3,793 enrolled at IMPACT III elementary or middle schools, and 3,451 students enrolled in Comparison schools. The Comparison schools were selected because their demographics and achievement were similar, at baseline, to the IMPACT III schools. The table below illustrates the primary variables on which they were matched.

Table 2. *Demographic characteristics of IMPACT III and Comparison schools (gr.3-8)*

| | IMPACT III | Comparison |
|---|---|---|
| Total number of students enrolled in 2009 | 3,793 | 3,451 |
| Demographics- | | |
| White | 45.4% | 46.9% |
| Black | 39.8% | 34.1% |
| Other | 14.8% | 19% |
| Economically Disadvantaged | 57.5% | 59.1% |
| Students with Disabilities | 14.4% | 10.9% |

*IMPACT III: Changes in Reading achievement in Years 1-3.* Because 3 time points were available for this group, HLM analyses were used to examine changes in the DV (Reading scale score) over time. The null/fully unconditional model was conducted to partition the variance between each level of the model and to ensure that there was sufficient variability at Level 1 and Level 2 to warrant continuation with analyses (Raudenbush & Bryk, 2002). Only the dependent variable, Reading scale score, was entered in this model. Results from this analysis indicated that 76% of the variability in Reading scale score was between-students ($\tau_{00}$ = 112.63, $z$ = 49.21,

$p < .0001$) and 24% was within students ($\sigma^2 = 36.44$, $z = 66.71$, $p < .0001$). Therefore, the null/fully unconditional model indicated that there was sufficient variability to warrant further analyses.

A subsequent model was used (Means-as-Outcomes regression) to measure the relationship between the school in which a student was enrolled (IMPACT school v. Comparison school) and their Reading scale score. Specifically, this model measures whether there were any between-student differences in Reading scale scores. Also, it measures how much between-student variability is accounted for by knowing whether the student attended an IMPACT III school or a Comparison school. There was a significant relationship between whether students were enrolled at an IMPACT III or Comparison school and their average Reading scale score. On average, students in IMPACT III schools scored higher than students in Comparison schools. ($\Upsilon_{01} = 2.382$, $t$=8.64, $p$<.0001) However, this model accounted for only 1% of the between-student variability in Reading scale score.

The next model attempted to determine if the change in Reading scale score over three years was dependent on students' project school enrollment. Results showed no significant project school enrollment x administration year interaction, such that the change/growth over time in Reading scale score was unrelated to the students' project school enrollment ($\Upsilon_{11}$= -0.0585, $t$= -0.61, $p$=.5424). Additional models indicated that there was no significant interaction between year x project school enrollment x free/reduced lunch status, or between year x project school enrollment x SWD, indicating that the relationship between growth over time and project school enrollment was not significantly related to either students' ED status or disability status.

When school level was added to the equation, results indicated that growth in Reading scores over time simultaneously depended on project school enrollment and school level (i.e. school level x year x project school enrollment $\Upsilon_{13}$= .8539, $t$= 4.18, $p$<.0001). The largest average change in Reading scores was among students enrolled in IMPACT middle schools. Specifically, middle school students in IMPACT III schools showed more growth in Reading scores (avg. increase of 7.45 pts) than middle school students in Comparison schools (avg. increase of 5.61 pts). This model accounted for 50% of the within-student variability and 8% of the between-student variability. This finding may indicate that the effects of instructional technology on Reading achievement are more pronounced with older students, but further investigation is required.

*IMPACT III: Changes in Math achievement in Years 1-3*. The null/fully unconditional model was conducted to partition the variance between each level of the model. Only the dependent variable, Math scale score, was entered in this model. Results from this analysis indicated that 72% of the variability in Math scale score was between-students ($\tau_{00} = 84.932$, $z = 48.27$, $p < .0001$) and 28% was within students ($\sigma^2 = 32.744$, $z = 67.31$, $p < .0001$). Therefore, the null/fully unconditional model indicated there was sufficient variability to warrant further analyses.

A subsequent model was used (Means-as-Outcomes regression) to measure whether there were any between-student differences in Math scale scores, based on their enrollment in an IMPACT III school or a Comparison school; this model indicated that there was a significant relationship between their school enrollment (IMPACT v. Comparison) and their average Math scale score. On average, students in IMPACT III schools scored higher than students in Comparison schools ($\gamma_{01}$ = 2.364, $t$=9.78, $p$<.0001). However, this model accounted for only 2% of the between-student variability in Math scale score.

The next model assessed whether the change/growth in Math scale score over three years was dependent on students' project school enrollment. Results showed a significant school enrollment x year interaction, such that the change/growth over time in Math scale score was dependent on the students' project school enrollment ($\gamma_{11}$= 0.4223, $t$= 4.72, $p$<.0001). Specifically, students enrolled in IMPACT III schools showed slightly stronger growth (avg. increase of 5.2 points) in Math scores than students enrolled in Comparison schools (avg. increase of 3.85 pts).

Using Logistic Regression techniques to examine Math achievement levels (I – IV) revealed that IMPACT III students tended to show more improvement than their Comparison counterparts. This is consistent with previously reported findings from multilevel analyses. Looking at the change in achievement level from 2007 (baseline) to 2009, we see that IMPACT III students were 42% more likely to increase achievement levels (OR=1.593, $p$=.000). This finding, in particular, is consistent with findings from the IMPACT I cohort, including only elementary schools from 2003 to 2006, in which it was observed that IMPACT I students were 37% more likely to increase performance levels in Math from baseline to Year 2 (Osborne, et al., 2007).

To further illustrate this difference, binary logistic regression was used to measure differences in the odds of passing or scoring above grade level between IMPACT III and Comparison students, in 2007 (baseline) and 2009 (Year 2). The outcome variables were dichotomous – pass (Level 3-4)/fail (Level 1-2) and Level 4/ Level 1-3. While IMPACT III and Comparison students were equally likely to pass the Math EOG in 2007, IMPACT III students were significantly more likely to pass, and score above grade level on the Math EOG in 2009 (p<.001).

*Student Achievement Outcomes – IMPACT IV*

There were 9,427 students included in these analyses who took an End-of-Grade test while enrolled at an IMPACT IV or matched Comparison school in 2009. The groups included 4,977 enrolled at IMPACT IV elementary or middle schools, and 4,450 students enrolled in Comparison schools. The Comparison schools were selected because their demographics and achievement were similar, at baseline, to the IMPACT IV schools. The table below illustrates the variables on which they were matched.

Table 3. *Demographic characteristics of IMPACT IV and Comparison schools (gr.3-8)*

| | IMPACT IV | Comparison |
|---|---|---|
| Total number of students enrolled in 2009 | 4.977 | 4,450 |
| Demographics- | | |
| White | 44.6% | 50.4% |
| Black | 31.2% | 24.4% |
| Hispanic/Latino | 18.6% | 18% |
| Economically Disadvantaged | 65.8% | 65.4% |
| Students with Disabilities | 12% | 11.3% |

*Changes in Math and Reading achievement – Year 1 to Year 2.* Because only two timepoints were available for analysis (the IMPACT IV cohort began implementation in 2008), logistic regression was used to analyze differences in IMPACT IV and Comparison students' odds of passing between Year 1 and Year 2. Results indicated that the odds of passing the Math EOG test did not change significantly from 2008 to 2009 for either IMPACT IV schools or their matched Comparison schools. However, the year of administration was a significant predictor of whether students would pass the Reading EOG at IMPACT IV schools. The odds of an IMPACT IV student passing the Reading EOG test in Year 2 were 1.133 times their odds of passing in Year 1 (p = .004). This same pattern was not observed in Comparison schools. Specifically, IMPACT IV students were 7% more likely to pass Reading in 2009 than they were in 2008. The odds ratios, relative risks, and p-values for both groups can be found in Table 4.

Table 4. *Odds of passing EOG tests in 2008 and 2009 for IMPACT IV & Comparison schools*

| | | Odds Ratio | Relative Risk | p-value |
|---|---|---|---|---|
| **Math** | Comparison | 1.054 | 1.02 | .261 |
| | IMPACT IV | 1.074 | 1.03 | .105 |
| | Comparison | 1.058 | 1.03 | .204 |

| | | | | |
|---|---|---|---|---|
| **Reading** | IMPACT IV | 1.133 | 1.07 | .004 |

Additional models suggest that, to date, the IMPACT IV model seems to have had a more noticeable impact on Economically Disadvantaged (FRL) students. Analysis of the passing rates of FRL students on the Math and Reading EOG test determined that the year of administration was a significant predictor for IMPACT IV schools, but not Comparison schools. Specifically, the odds of an FRL student at an IMPACT IV school passing the Math EOG increased significantly from Year 1 to Year 2 (p = .007). The odds increased slightly for Comparison students, though the increase was not significant. The year of administration was also a significant predictor of passing rates on the Reading EOG for IMPACT IV schools (OR = 1.192, p = .002). Specifically, FRL students in IMPACT IV schools were 9% more likely to pass the Reading EOG in 2009 than they were in 2008. The odds ratios, relative risks, and p-values for both groups can be found in Table 5.

Table 5. *Odds of FRL students passing the EOG test at IMPACT IV and Comparison schools*

| | | Odds Ratio | Relative Risk | p-value |
|---|---|---|---|---|
| | Comparison | 1.117 | 1.07 | .053 |
| **Math** | IMPACT IV | 1.156 | 1.10 | .007 |
| | Comparison | 1.095 | 1.04 | .111 |
| **Reading** | IMPACT IV | 1.192 | 1.09 | .002 |

## Significance

The components of the IMPACT model are designed to provide the additional support and scaffolding necessary to leverage the technology in valuable ways, ultimately improving student learning experiences. The model includes strong leadership and support from the administration as essential components for successful implementation, a common feature of many educational innovations and initiatives being introduced in a K12 setting. Further, the emphases on collaborative planning and professional development reflect research-based practices intended to create a supportive and enriching environment for the integration of technology into instruction.

Results collected from the four cohorts of the IMPACT evaluation indicate that there are a number of interesting effects associated with this model, though these effect vary to some extent depending on the cohort measured. The district-wide model used in IMPACT III and IV appears to have a promising association with student achievement, but each iteration of the model has seen positive effects on teacher variables such as technology skills and use of technology for instruction. Future plans in IMPACT schools involve "taking it to the next level," focusing on improvement in classroom instruction, using more complex technological resources, and allowing students to become producers of technological products, rather than just consumers of technology.

It is important to evaluate the contribution of each facet of this model to student learning and achievement, as well as changes observed in teachers' instructional practices. A primary goal of the IMPACT model is to produce technologically literate students equipped with the knowledge and 21st Century skills necessary to become productive members of their communities, so these results would be interesting to practitioners, as well. Further, improving technology integration in educational settings is of critical importance, and knowledge of how to best evaluate these types of programs will be very useful to many educational researchers.

This evaluation will continue through the 2010/11 school year under the umbrella of the IMPACT Continuation project, and findings will be expanded throughout the coming year to include changes in college attendance/performance for graduates of IMPACT high schools. Specifically, all high schools in the IMPACT III and IV cohorts have received additional funding to purchase teacher and student laptops in Spring 2010. The K-8 schools in these cohorts have received funding to purchase teacher laptops for everyone, and upgrade existing equipment. Given the broad support for the IMPACT model within the state of North Carolina, we anticipate that findings from the ongoing evaluation will continue to inform school reform efforts in our state.

Interested session participants may contact the authors or the NC Dept of Public Instruction – Instructional Technology Section Chief (nkimrey@dpi.state.nc.us) for additional information.

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