



**MEROLA
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**Impact of Discovery Education's Science Techbook in
Rock Hills District Schools 4th Grade Students**

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Submitted to:

Discovery Education

A decorative graphic at the bottom of the page consists of several overlapping, semi-transparent geometric shapes. The shapes are primarily light blue and grey, with some darker blue accents. They are arranged in a way that creates a sense of depth and movement, resembling a stylized landscape or a series of connected blocks.

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EXECUTIVE SUMMARY

Background

During the 2012-2013 school year, Discovery Education’s Science Techbook™ was piloted in elementary schools located in Rock Hill School District Three of York County, South Carolina. All K-5 teachers were provided with professional development training on the use of Science Techbook but were left free to decide whether or not they would use Science Techbook in their classrooms. Merola Research was engaged to design and implement a research study to determine the impact the use Science Techbook has on student achievement.

Merola Research analyzed data from the 2013 Science Palmetto Assessment of State Standards (PASS) in science for fourth-grade students to identify differences in student science achievement among those using and not using Science Techbook:

- Students were placed into comparable groups using propensity score matching.
- Students were matched on 2012 Math PASS scores, gender, ELL, Special Education, race, Free or Reduced Price Lunch status, teacher years of service and teacher certification.

Conclusion

After one year of implementation in Rock Hill Schools, fourth grade students whose teachers used Discovery Education Science Techbook scored higher on average on the 2013 Science PASS than students whose teachers did not use Science Techbook.

Results indicate that, on average, students of teachers using Discovery Education Science Techbook and students of teachers not using Science Techbook scored at or above the *Proficient Level* on the 2013 Science PASS at similar rates. However, students in classrooms using Science Techbook were more likely to score at or above the *Exemplary Level* performance than students in classrooms not using Science Techbook.

ABOUT DISCOVERY EDUCATION K-8 SCIENCE TECHBOOK

Discovery Education Science Techbook™ is a digital instructional resource that incorporates virtual labs, explorations, e-books, digital images, audio clips, video clips, songs, and an interactive glossary to enable teachers to implement lessons that are aligned with the states’ science standards, engage students and address different learning styles. The Science Techbook includes a real-time assessment component that helps teachers monitor individual and class mastery of the content, and provides targeted remediation resources for students in need of additional support. In addition, this digital textbook provides teachers with an instructional framework and model lessons they can use and

The 5 E Instructional Model

Discovery Education Science Techbook approaches the learning of scientific thinking and practice through a 5E inquiry model of instruction that is centered on essential questions in science and culminates with a scientific explanation. The BSCS 5E Instructional Model or the 5E, consists of five phases: Engagement, Exploration, Explanation, Elaboration, and Evaluation.¹ During the engagement phase, instructors assess the prior knowledge of their students and help them become engaged with new material through short activities. Students in the Exploration phase perform activities designed to provide them with a common understanding of current concepts, processes and skills. In the Explanation phase, students demonstrate their understanding of material learned during the Engagement and Exploration phases. In this process, teachers introduce a concept, students explain their understanding of it, and then teachers can provide additional Explanations. During the Elaboration phase teachers work with students to challenge their understanding and deepen their knowledge through new experiences. Finally, in the Evaluation phase, teachers evaluate student progress and students assess their understanding of the material.

Professional Development

To facilitate teachers' adoption of the Science Techbook, Discovery Education provided professional development activities that built teachers capacity to (a) navigate the Science Techbook website; (b) employ the 5E model of instruction in their classrooms; (c) create student-centered classrooms that incorporate the use of learning labs; and (d) use Science Techbook to differentiate instruction for students with different learning styles and needs. Professional development training activities also allowed teachers to develop activities that allow students to explore the resources available within Science Techbook on their own.

Science Techbook was piloted in grades K-5 in Rock Hill School District specifically to increase students' and teachers' proficiency in the use of technology and increase the use of inquiry-based instruction in STEM instruction.

¹ Bybee, R.W., Taylor, J.A., Gardiner, A., Van Scotter, P., Powell, J.C., Westbrook, A., & Landes, N. (2006). *The BSCS 5E Instructional Model: Origins and Effectiveness*. Retrieved on May 10, 2013 from [http://science.education.nih.gov/houseofreps.nsf/b82d55fa138783c2852572c9004f5566/\\$FILE/Appendix%20D.pdf](http://science.education.nih.gov/houseofreps.nsf/b82d55fa138783c2852572c9004f5566/$FILE/Appendix%20D.pdf).

STUDY DESCRIPTION

In 2012, Rock Hill School District Three of York County, South Carolina (Rock Hill Schools) piloted Discovery Education Science Techbook for use with students enrolled kindergarten through 5th grade. Discovery Education Professional Development Specialists trained 88 of Rock Hill's elementary school teachers in grades K-5 how to use the Science Techbook for classroom instruction. All teachers were provided with training; however, teachers chose whether to use Science Techbook or not. A total of 63 teachers used Discovery Education Science Techbook in their classrooms.

A quasi-experimental research design was used to assess the impact of Discovery Education Science Techbook on science achievement among the fourth grade students in the pilot study. Our matching process for the study involved using propensity scores (see Austin, 2011 and Thoemmes & Kim, 2011). The propensity score allows one to analyze data from a study in which program participants were not randomly selected to either participate or not participate in the intervention in a way that mimics some of the characteristics and assumptions of a randomized controlled trial. The basic idea in propensity score matching was to find a large group of students within the Rock Hill School District whose teachers did not use Discovery Education but were very similar to those students whose teachers used Science Techbook on a variety of pre-intervention characteristics, such as demographic backgrounds and prior history of academic achievement in science or courses closely related to science, such as math, if prior test scores in science were not available. That being done, differences in the outcomes of this well selected comparison group of students and of the students whose teachers used Science Techbook could be attributed, with a high degree of certainty, to the use of Discovery Education Science Techbook.

Rock Hill Schools provided Discovery Education with 2013 Science Palmetto Assessment of State Standards (PASS) score data for 4th grade students in the district to use as an outcome measure. For the analyses, groups were matched on 2012 Math PASS scores, gender, ELL, Special Education, Race, Free or Reduced Price Lunch status, teacher years of service and teacher certification. Math 2012 PASS scores were used as a measure of prior achievement since only half of the students took the science PASS in 2012 due to it being sample tested at 3rd grade. Math 2012 and Science 2013 PASS scores were highly correlated ($r = .735, p < .001$). Prior to matching there were 534 DE students and 689 non-DE user students. After matching there were 484 DE students and 618 non-DE user students.

The majority (58%) of teachers in the whole sample had an Elementary certification. The remainder of the teachers (42%) had one of the following certifications: Reading teacher,

Biology, Early Childhood, Emotionally Disabled, English as a Second Language, Gifted and Talented (GT), Gifted and Talented (Endorsement), and ML Social Studies.

WHO IS USING DISCOVERY EDUCATION SCIENCE TECHBOOK?

At the 4th grade, prior to propensity score matching, student demographic characteristics were similar between teachers who used Science Techbook and those who did not (Exhibit 1). The students in the two groups of classes were similar in terms of eligibility for Free or Reduced Priced lunch eligibility, gender and racial composition, English Language Learner status, and Special Education status. Students in Science Techbook classrooms scored higher on average on the 2012 Math PASS than students in non-Science Techbook classrooms.

Both groups of fourth grade teachers had many years of service on average, though fourth grade teachers that used Science Techbook during the school year were more experienced on average than those that did not use Science Techbook (Exhibit 1). Fourth-grade teachers that used Science Techbook had an average of 18.93 years of experience in 2012-2013, compared to 17.15 years of experience on average for teachers that did not use Science Techbook. Fourth grade Science Techbook users were more likely to have a certification than “Elementary” (49%) versus non-Science Techbook users (36%).

Exhibit 1. 4th Grade Student and Teacher Characteristics, 2012-2013 School Year

Student Characteristics					
Variable	Science Techbook User (n=534)		Non-User (n=689)		Difference
	Mean	SD	Mean	SD	
Math 2012 Scale Score	647.67	63.31	639.04	52.72	8.63*
Free or Reduced Price Lunch Eligibility	0.59	0.49	0.59	0.49	0.00
Female Student	0.49	0.50	0.51	0.50	-0.02
Race/Ethnicity (Asian/Pacific Islander, Native American, Hispanic or African-American)	0.51	0.50	0.47	0.50	0.04
Special Education	0.13	0.34	0.16	0.36	-0.03
ELL Status	0.05	0.21	0.06	0.23	-0.01

Teacher Characteristics					
	Science Techbook User (n=24)		Non-User (n=35)		
Teacher Years Served as of 2012-2013	18.93	9.35	17.15	9.76	1.78***
Teacher Other Certification as of 2012-2013	0.49	0.50	0.36	0.48	0.13***

Source: Rock Hills School District, 2014

Note: Significance Levels: *** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.10 (two tailed test)

IS USE OF DE SCIENCE TECHBOOK RELATED TO INCREASES IN STUDENT ACHIEVEMENT?

T-test analyses of the matched sample of students indicate that students whose teachers used Science Techbook scored higher on average on the 2013 Science PASS than students whose teachers did not use Techbook (Exhibit 2)

Further analyses determined that on average, students of teachers using Science Techbook and those not using Science Techbook met standards or above on the 2013 Science PASS at similar rates. However, students in Science Techbook classrooms were more likely to score above the level for exemplary performance than students in non-Science Techbook classrooms (Exhibit 2).

Exhibit 2. 4th Grade Student Test Scores, Percent Proficient or Higher, and Percent Exemplary Level or Higher

4 th Grade Students					
	Science Techbook User (n=484)		Non-User (n=618)		
Variable	Mean	SD	Mean	SD	Difference
Student 2013 Science PASS Test Score	631.77	52.03	625.88	45.03	5.89*
Proficient Level Score or Higher	0.74	0.44	0.74	0.44	0.00
Exemplary Level or Higher	0.21	0.41	0.15	0.35	0.07***

Source: Source: Rock Hills School District, 2014

Note: Significance Levels: *** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.10 (two tailed test)

CONCLUSIONS

After one year of implementation in Rock Hill Schools, fourth grade students with teachers who used Discovery Education Science Techbook scored higher on average on the 2013 Science PASS than a comparable group of students whose teachers didn't use the Science Techbook.

Teachers in both groups were veteran teachers, though the teachers that used the Science Techbook were more likely to have a certification other than Elementary. Students in both groups were scoring at the Proficient Level or above on the science PASS; however, the students whose teachers were using Science Techbook were more likely to score at the Exemplary Level or higher.