

EXECUTIVE SUMMARY

# Using STEM Case Studies to Prepare Today's Students for Tomorrow's Jobs

An Evaluation of  
Spark 101 Interactive STEM Videos

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## About the Author

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Dr. Keller is an experienced researcher and evaluator in the areas of science and mathematics instruction. She has served as the Supervisor of Applied Research in the Montgomery County Public Schools; Associate Professor at the University of Maryland, College Park in the Department of Educational Measurement, Statistics, and Evaluation; and as the Director for Science Education Programs at The National Institute of Mental Health.

Dr. Keller is the author of numerous articles in publications such as *The Journal of Educational Research*, *The Journal of Research in Science Teaching*, and *The Journal of Educational Psychology*. She is the recipient of awards from The American Educational Research Association, The National Center for Education Statistics, and The International Testing and Evaluation Association, and she is an experienced presenter on issues related to STEM (science, technology, engineering, and math) education and college readiness.

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**“The jobs of the future will require STEM-capable workers who can use technology, propose innovative approaches, devise creative solutions, and communicate ideas effectively.”**

## **Executive summary**

This evaluation describes the effectiveness of using Spark 101 STEM Skills Videos (Spark 101) to improve students’ college and career readiness in the areas of science, technology, engineering and mathematics (STEM). Results show that Spark 101 increased STEM understanding and interest among students with low STEM engagement, and that Spark 101 increased the STEM career awareness and skills of all students.

### **The need for STEM-capable workers**

The jobs of the future will require STEM-capable workers who can use technology, propose innovative approaches, devise creative solutions, and communicate ideas effectively. STEM skills are the gateways to success in 21<sup>st</sup> century jobs, even jobs in non-STEM fields. Unfortunately, the majority of high school graduates are unprepared for college-level STEM courses and the workplace.

### **Building STEM-capability**

High school STEM course pathways are key to helping students acquire the STEM knowledge and skills that underlie postsecondary success. Although the effect of any given course may be small, the cumulative impact of STEM coursework on students’ overall levels of STEM engagement and preparedness can be large.

The instructional experiences that best prepare students for postsecondary success are those that offer opportunities for students to discern the difference between the body of knowledge in a given subject area and the processes by which that knowledge was developed. Inquiry-based learning experiences in high school STEM courses provide those opportunities and prepare students to meet the challenges of college and careers, regardless of their eventual field of study.

**“Case studies are one of the best ways to bring into the classroom the inquiry-based experiences that prepare students for postsecondary success.”**

**“Spark 101, a program developed by The 114<sup>th</sup> Partnership, uses an online interactive video format to present case studies guided by STEM professionals.”**

## **Using case studies to improve stem capability**

Case studies are one of the best ways to bring into the classroom the inquiry-based experiences that prepare students for postsecondary success. Case study experiences allow students to apply course content in a meaningful context. The experiences deepen students’ understanding of what they are learning, strengthen their problem-solving skills, and make the subject matter easier to remember.

Changes in technology have expanded the case study formats available to teachers. Spark 101 STEM Skills Videos (Spark 101), a program developed by the 114<sup>th</sup> Partnership, uses an online interactive video format to present case studies guided by STEM professionals. Teachers can access free Spark 101 videos and curriculum-aligned teaching materials online at [www.spark101.org](http://www.spark101.org).

Spark 101 allows STEM teachers to choose from a collection of more than 50 case studies. The cases require students to think critically about real world STEM problems that have no “right answer,” to challenge alternative solutions, and to refine their conclusions as new data are collected. Each video also includes information about the STEM course and career pathways highlighted in that case.

**“Spark 101 had statistically and practically significant effects on STEM engagement among students who, prior to Spark 101, had little understanding or interest in STEM pathways.”**

## **Key evaluation findings**

The results presented in this evaluation are drawn from a national sample of students whose teachers used Spark 101 in fall 2015. Pretest data were used to identify students who differed in their levels of overall STEM engagement prior to participation in Spark 101.

Changes in STEM engagement and preparedness are presented for students with low versus high prior STEM engagement.

### **STEM engagement**

Spark 101 had statistically and practically significant effects on STEM engagement among students who, prior to Spark 101, had little understanding of or interest in STEM pathways. After using Spark 101, students with low prior STEM engagement were significantly more likely to

- Understand the relevance of their high school STEM courses.
- Be interested in STEM courses and careers.
- Increase their STEM coursetaking plans.

Students with high levels of STEM engagement expressed keen understanding and interest in STEM courses and careers prior to program participation. These students maintained high levels of STEM understanding and commitment after they completed Spark 101 case studies.

### **STEM preparedness**

More than 70 percent of students with low prior STEM engagement reported that Spark 101 increased their awareness of STEM careers and their understanding of how their STEM coursework relates to STEM careers. About 90 percent of students with high prior STEM engagement reported increases in their STEM awareness and understanding.

About 80 percent of students with low prior STEM engagement reported that Spark 101 improved their STEM skills and their knowledge of how professionals draw upon those skills to solve STEM problems. About 90 percent of students with high prior STEM engagement reported improvements in their STEM skills and knowledge.

**“Spark 101 increased students’ awareness of STEM careers and improved their STEM skills.”**

**“Students’ positive reactions to Spark 101 provide further evidence of the role that case studies can play in preparing students for postsecondary success.”**

### **Spark 101 effectiveness**

Spark 101 can play a significant role in helping students prepare for STEM pathways. Although the case studies last only one or two class periods, results suggest that they have a significant positive impact on student engagement among students who, prior to Spark 101, have little understanding of and interest in STEM courses and careers. Students reported that Spark 101 increased their awareness of STEM careers and improved their STEM skills. Students’ positive reactions to Spark 101 provide further evidence of the role that case studies can play in preparing students for postsecondary success.

## The 114<sup>th</sup> Partnership<sup>®</sup>

Spark 101<sup>®</sup> is a program of the 114<sup>th</sup> Partnership, a national nonprofit that facilitates productive partnerships between educators and employers.

Our collaborations support ongoing relationships and measurable outcomes. Since 2013, we have reached approximately 2,000 educators and 500,000 students.

By connecting classwork to professional pathways, we will help one million students graduate college- and career-ready by 2020.

For more information on  
**Spark 101 Interactive STEM Videos,**  
email [professionalpathways@114th.org](mailto:professionalpathways@114th.org).  
[www.Spark101.org](http://www.Spark101.org)

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