SISEP
State Implementation and Scaling-up of Evidence-based Practices

# Improved Mathematics Outcomes using Active Implementation: Kentucky's Effective and Durable Change

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## Kentucky educators are defying the odds.

With focus, persistence, and a collective commitment to results-driven accountability, teachers in four districts have improved mathematics outcomes for students with disabilities in general educations settings. Their efforts have also improved outcomes for Black students who typically fall behind their peers in mathematics achievement (Berry et al., 2014; National Center for Learning Disabilities, 2020). This brief presents the results from an evaluation of four school districts' efforts to improve mathematics achievement in Kentucky.

The purpose of the study was to investigate whether the districts that received ongoing training and coaching to use the Active Implementation Frameworks (https://nirn.fpg.unc.edu/ai-hub) improved mathematics outcomes. The Active Implementation Frameworks represent five essential approaches for effective implementation of any evidence-based program or practice. One of the frameworks is a clearly defined and operationalized *usable innovation*, or any evidence-based practice that is easily measured for adherence to the program design. The subject of Kentucky's usable innovation is mathematics and use of the 8 mathematical teaching practices developed by the National Council of Teachers of Mathematics (NCTM, 2014).

The evaluation focused on priority populations, specifically students with disabilities and Black students, and compared their outcomes to a carefully matched district that did not receive the same level of support. Results show that the four districts that received ongoing support improved mathematics outcomes for students with disabilities and students who are Black compared to the matched district.


## Active Implementation

In 2014, the Kentucky Department of Education partnered with the State Implementation and Scaling-up of Evidence-Based Practices (SISEP) Center to effectively implement the State Systemic Improvement Plan. They aimed primarily to improve student mathematics outcomes for students with disabilities. Participating leaders and educators believed that the quality of teachers' instructional practice in the classroom was the most significant factor in teaching mathematics for closing long-standing deficits and disparities in student outcomes (Harper, 2019; Hattie, 2003; NCTM, 2020).

**The Transformation Zone is a vertical slice of the system, small enough to be manageable, large enough to represent equity of context and need, and large enough to disturb the system for trial, learning, and scalability.**

To achieve their aims, Kentucky stakeholders with diverse perspectives and roles created a quality standard for mathematics instruction delivered in the general education setting. Then Kentucky educators with specialized expertise created training, coaching, and data systems for use in participating districts and their schools. Teachers received support to use non-evaluative observation data in aggregate, without teacher identifiers, to set schoolwide goals for instructional improvement. Teams at the school, district, region, and state delivered the supports and resources teachers required to continuously improve their instructional practice and meet their schoolwide goals for improvement.

To ensure equitable access to effective instruction by every student in every classroom, leaders and educators focused on removing the variability in the support systems available for teachers and school staff. Districts represented a variety of contexts (large urban to small rural) to increase the chance that the model could scale to additional districts once fully developed and tested in the first iteration of Kentucky's *Transformation Zone*. This brief presents initial findings from the State Systemic Improvement Plan initiative in five districts and 33 schools. Districts and their schools who received intensive support are referred to as *Transformation Zone* or TZ schools. The comparison district and their schools who did not receive intensive support are referred to as non-TZ.

## State Systemic Improvement Plan

To achieve effective and durable change, Kentucky focused on effectively implementing the State Systemic Improvement Plan to meet the Kentucky Department of Education's State Identified Measurable Result:

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*To increase the percentage of students with disabilities performing at or above proficient in middle school math, specifically at the 8th grade level, with emphasis on reducing novice performance, by providing professional learning, technical assistance and support to elementary and middle school teachers around implementing, scaling, and sustaining evidence-based practices in math.*

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To evaluate whether the Kentucky Department of Education met its goals for students with disabilities, this investigation presents preliminary results across four school years. Data collection began in the 2015-16 school year, and initial implementation of the State Systemic Improvement Plan began in the 2016-17 school year. Figures A, B, and C display the percent of students in *novice, apprentice*, and *proficient* and *distinguished* categories for math from the Kentucky Performance Rating for Educational Progress (K-PREP). **Tables 1-9** in the Appendix provide fixed effects linear gain models tested for change across time in the percent of students in each of the K-PREP categories.

# Results

The results suggest that use of Kentucky's mathematics innovation in the general education setting improved outcomes for students with disabilities and Black students. Quality instruction for all is imperative to ensure equitable opportunity and access to effective instruction for underrepresented populations – students cannot benefit from innovations they do not experience (Fixsen et al., 2005). Kentucky leaders and educators believed if they provided professional learning, technical assistance, and support to elementary and middle school teachers they would contiguously improve teacher practice and improve mathematics outcomes for students with disabilities. Fixsen et al. (2013) propose effective implementation methods are required to ensure consistent use of programs by teachers that reliably benefit students. Participating TZ schools received ongoing support to develop the capacity to use Kentucky's mathematics innovation and the training, coaching, and data use systems designed to effectively implement the State Systemic Improvement Plan. The onus can no longer rest on the shoulders of teachers and school staff. A systematic approach is required to support teachers' growth and development (Darling-Hammond et al., 2020).

### Students with Disabilities

**Figure A** shows the percentage of 6th- to 8th-grade students with a disability and an Individualized Education Program (IEP). The percentage of proficient and distinguished math students with disabilities increased in TZ schools from 2015-16 to 2018-19 (12.1% to 15.8%). In contrast, students with disabilities in the non-TZ schools showed a decrease in the proficient and distinguished math category (13.8% to 10.4%) during the same school years. The difference in percentage change in the proficient and distinguished category between TZ and non-TZ schools is associated with an effect size of *d* = 0.73 standard deviations, a large difference, favoring TZ schools. An effect size is a standardized way to characterize change. To help interpret the effect size, Hill et al. (2008) reported that regular education students in Grades 6 to 8 typically improve at a rate of about 0.30 standard deviations from a full year of mathematics instruction in school. The effect size of 0.73, however, compares gains among students in TZ schools to students in non-TZ schools, all of whom received a full year of instruction.

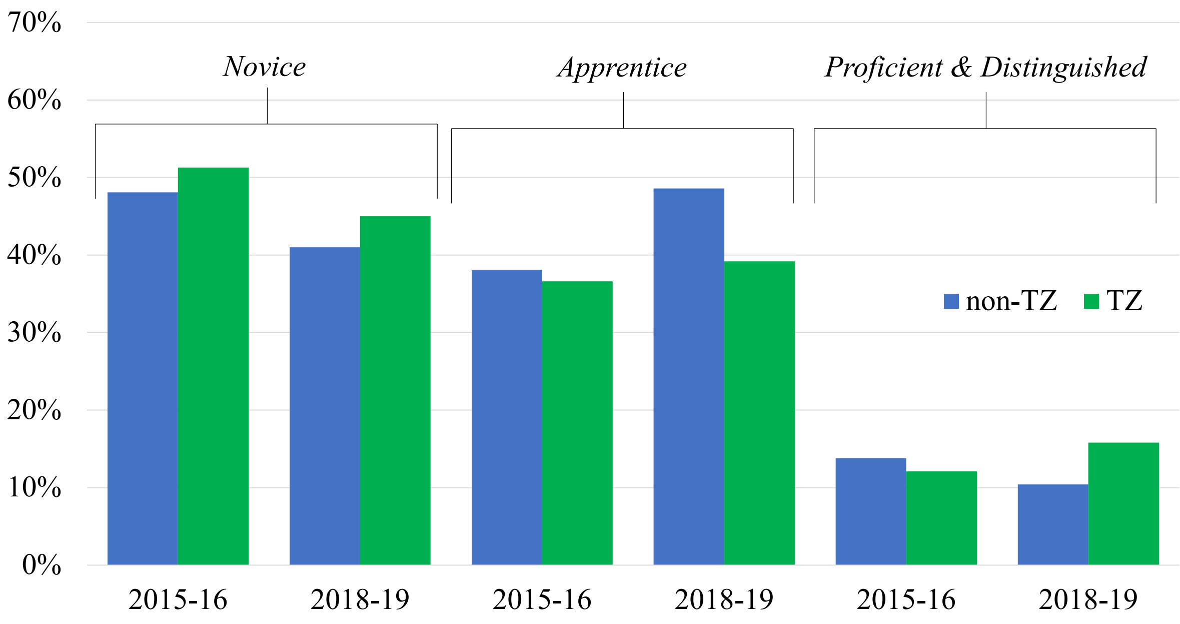


**Figure A. 6th - 8th grade students with a disability and IEP**

**Figure B** shows the percentage of students in Grades 3 to 5 with a disability and an IEP. From 2015-16 to 2018-19, the percentage of students with disabilities in the novice category decreased in the TZ schools (47%% to 35%) but increased in non-TZ schools (48% to 49%). These students increased in the apprentice category in TZ schools (31% to 35%) but decreased in non-TZ schools (34% to 31%). They also increased in the proficient and distinguished category in TZ schools (21% to 30%) more than in non-TZ schools (18% to 20%).

The three comparisons were associated with effect sizes of d = –0.90, 0.46, and 0.62, respectively, all large differences. Regular education students in Grades 3 to 5 typically improve at a rate of about 0.50 standard deviations from a full year of school (Hill et al., 2008).

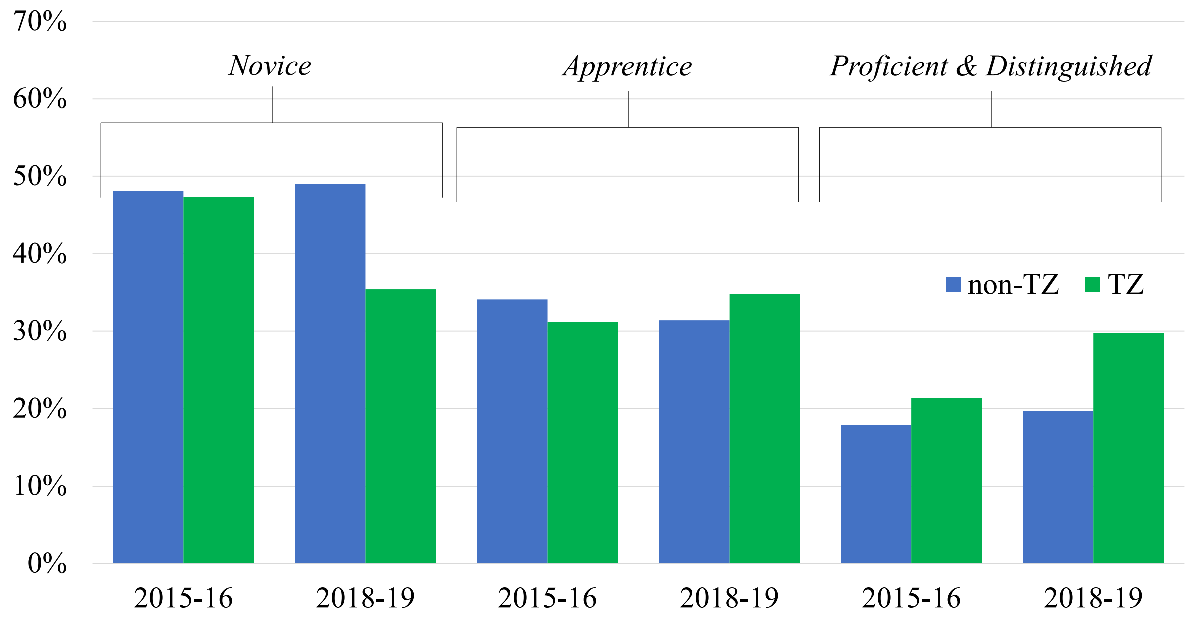


Figure B. 3rd - 5th grade students with a disability and IEP

### Students who are Black

The goal of the State Systemic Improvement Plan was to improve mathematics outcomes for students with disabilities in the general education setting. Therefore, all students had access to Kentucky's mathematics innovation. In TZ schools, this effort improved outcomes for students with disabilities and Black students. We report the results for Black students to demonstrate the power of quality general education instruction when teachers continuously improve their skills and engage students in meaningful interactions with the content.

**Figure C** shows the percentage of 6th- to 8th-grade Black students in each math category. One notable result emerged. The percent of Black students in the novice category decreased in TZ schools from 2015-16 to 2018-19 (35.7% to 34.9%) but increased sharply in the non-TZ schools (24.1% to 39.6%), a large effect of $d = -0.85$.

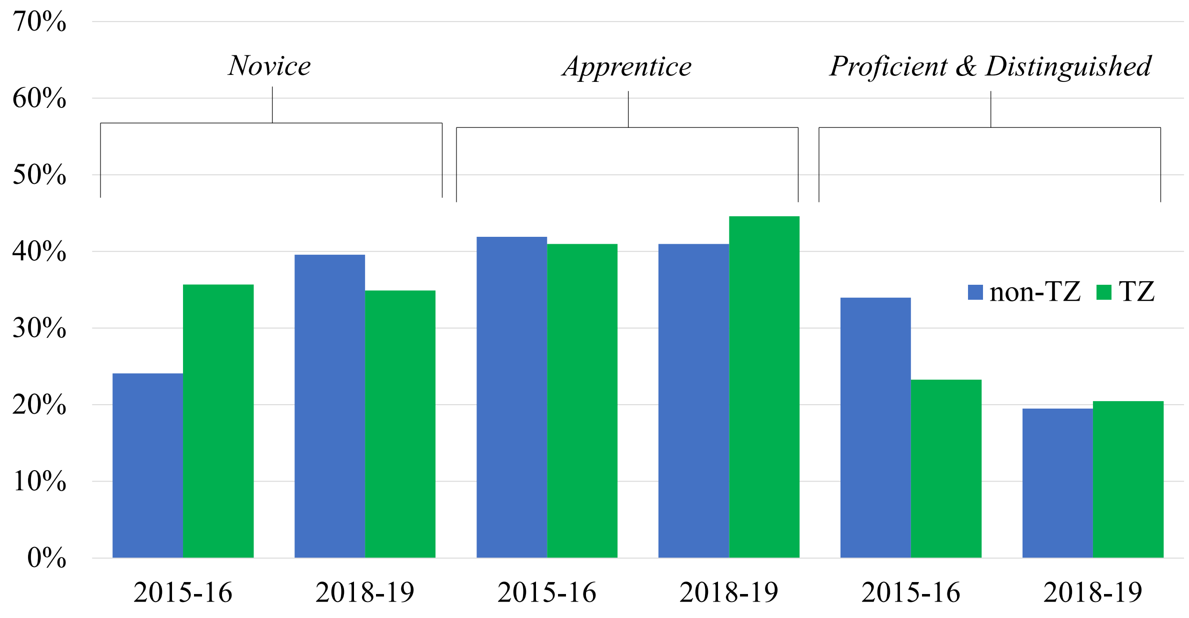


Figure C. 6th - 8th grade Black students

# Kentucky's Implementation Process

The Kentucky Department of Education (KDE) and the SISEP Technical Assistance Center used a stage-based approach to intentionally plan and guide all decisions regarding implementation (Stages of Implementation: https://nirn.fpg.unc.edu/module-4). During exploration, they assessed the fit between KDE goals and the intensive implementation informed support SISEP provides. They identified if there was buy-in from KDE leaders and their educational partners and gauged the willingness of state and regional leaders to form a team, meet monthly, and visibly champion all aspects of the work ahead. Exploration activities concluded with a mutual agreement to proceed as KDE began installation stage activities.

### Installation Stage

During installation, stakeholder teams with diverse perspectives, expertise, and roles create the infrastructure necessary to effectively implement a selected program or practice (Metz, 2015). During the installation stage, two regional cooperatives and a large urban district mutually agreed to participate in the Transformation Zone. The SISEP Center provided monthly onsite and virtual implementation informed support. Throughout the process, KDE and participating Regional Cooperatives developed the capacity to use the Active Implementation Frameworks with fidelity to support use of the mathematics innovation in the four Transformation Zone districts selected in 2015-16. State coaches, known as transformation specialists, and the regional coaches supported district teams monthly. Coaches used an "I do, we do, you do" process. In this process, coaches demonstrate a procedure, guide practice, and then provide opportunities for independent practice while observing and correcting mistakes (Fisher, 2008).

> **Getting from "here" to "there" is rarely obvious or a straight line. But radical imagination – daring to ask What if?- is always part of the process.**
>
> **Villanueva, 2018**

Simultaneously, as implementation teams were continuously supported, a diverse team of stakeholders (i.e., Institutes of Higher Education and regional, district, and school staff) defined and operationalized Kentucky's mathematics innovation. Co-creation of Kentucky's Usable Innovation: A How-To-Guide describes the process and provides examples and easy-to-use templates (Ryan Jackson et al., 2020). Then, KDE agreed to use the Observation Tool for Instructional Supports and Systems (OTISS; Fixsen et al., 2020) because a fidelity measure for mathematics instruction was not available. The OTISS comprises seven items derived from Hattie's (2009) findings on instructional practice that influence academic achievement. The OTISS is not used for teacher evaluation; instead, it assesses the quality of instructional practice and the support systems needed to enhance teacher practice. Teachers use OTISS data in aggregate to set schoolwide goals for improvement, plan lessons, conduct peer-to-peer observations, and continuously improve their instructional practice. A blog post that describes the OTISS (Ryan Jackson, 2020) and a series of podcasts with Kentucky educators who use the OTISS are available through the SISEP Center

(Ryan Jackson, Bailey et al., 2020). In the 2016-17 school year, the state, Regional Cooperatives, and districts were ready to select schools and teachers to participate. With a mathematics innovation in place, as well as accompanying systems of training, coaching, and data use, the Regional Cooperatives began preparing and training district and school teams, coaches, and teachers, so they were ready to enter the initial implementation stage.

**When a barrier is identified, teams can't keep pushing on, they have to stop and solve the barrier**

**Fixsen, 2019**

### Initial Implementation

Teachers begin to use the mathematics innovation and teams provide ongoing support to teachers and school teams during initial implementation. In the 2016-17 school year, initial implementation was initiated in Kentucky in Transformation Zone schools. Teachers and schools, districts and regions began using Plan-Do-Study-Act Cycles (Bryk et al., 2015). While Plan-Do-Study-Act Cycles are intuitive to educators, they require considerable time and resources to implement effectively (Tichnor-Wagner et al., 2017). Therefore, district, school, and teacher teams received ongoing training and coaching to analyze data, identify a problem and solution, and develop a plan to identify the people responsible for actionable items with a goal and timeline for completion. Using an effective team meeting protocol, teams in Kentucky's Transformation Zone repeat this cycle monthly using multiple forms of implementation and outcome data stored in the Kentucky Data Dashboard (see a demonstration of the Data Dashboard: https://datastudio.google.com/u/0/reporting/545fa6c8-784b-413f-8c9e-5d6b5b7878fe/page/pwccB). Teams identify barriers and report them to the team with the resources and authority to deliver viable solutions to remove the barriers (Blase, Fixsen, & Ryan Jackson, 2015). Kentucky's implementation teams embrace the research that suggests any one level of capacity without the other levels is found to be insufficient for effective and sustainable change at scale because, "when a barrier is identified, teams can't keep pushing on, they have to stop and solve the barrier" Fixsen, 2019, in conversation (Fixsen et al., 2018).

During the COVID-19 pandemic implementation was not halted. Some regions, districts, and TZ schools continued team meetings in virtual contexts. Some collected classroom observation data and provided teachers with actionable feedback to strengthen equitable access to effective instruction by all students. Kentucky continued to cast a wide net to engage stakeholders in this process because they believe expertise and solutions are found close to the ground where communities have direct experience of an issue (Villanueva, 2018). Teams work together to remove the variability in the system of supports available to teachers, from classroom to classroom and school to school, to increase equitable opportunity for all students to access high quality mathematics instruction (Akiba et al., 2007; Harper, 2019; Langley et al., 2009).

**Improving student outcomes requires not only engaging the hearts and minds of educators and stakeholders…but also changing the actions and behavior patterns of teachers, administrators, professional development providers and policy makers – and getting involved in systems change.**

**Blase et al., 2015**

### Full Implementation

Full implementation is achieved when at least 50% or more of practitioners are using the innovation with fidelity and improved outcomes are achieved. In the 2018-19 school year 50% of Kentucky's Transformation Zone schools and teachers moved into full implementation because they were using the mathematics innovation with fidelity and student mathematics outcomes were improving. The state and regional teams continue to take responsibility for all implementation efforts as they share lessons learned, such as feasibility of implementation, common challenges, and successes to be replicated and sustained through adequate resourcing and support. They convene monthly to use data to critically examine and improve the support systems for districts, schools, and teachers using feedback received at in person meetings, emails, and surveys. Teams use the Kentucky Data Dashboard to assess the implementation capacity of teams and they use training, coaching, and classroom observation data to assess if skill development is transferring to effective application by teams and teachers. With a system of supports proven to be effective, Kentucky leadership and educators have scaled use of the mathematics innovation to additional regions, districts, schools, and teachers.

Blase and colleagues capture the steadfast and persistent mission driven approach of Kentucky's educational leaders and educators when they state, "Improving student outcomes requires not only engaging the hearts and minds of educators and stakeholders…but also changing the actions and behavior patterns of teachers, administrators, professional development providers and policy makers – and getting involved in systems change" (Blase, Fixsen, Sims, & Ward, 2015, p. 4).

## Summary

Providing equitable access to effective mathematics instruction for all students, and especially for underrepresented populations, is a moral imperative (Banks, 2007; Fullan, 2010; Harper, 2019). The present study demonstrates how one state, in collaboration with their educational leaders and educators, was able to close long standing disparities in student outcomes for students with disabilities and students who are Black in the four Transformation Zone districts and 33 schools. Educational leaders in Kentucky were willing to acknowledge, "The problem is most districts don't have the time or resources to develop all of the systems and measures needed to use an innovation effectively" (Ryan Jackson et al., 2021, p.5). District leaders and principals provide compelling testimonials to their colleagues as they share, "I know we are going to build teachers' capacity, but not only are we going to build it, we are going to sustain it" because, "we get to say, 'what is the next best question we can ask?' and try to solve it" (Ryan Jackson et al., 2018, p. 15 & p. 17). Kentucky's educational leaders and educators are focused on what is needed.

Harper (2019) suggests what is needed is direct observation of teacher practice, a standard process to analyze data, and adequate time for teacher collaboration to increase their confidence in consistently providing all students access to high-status knowledge and skills (Chubbuck & Zembylas, 2008). The NCTM (2020) policy agenda emphasizes that it is teachers and what they do in the classroom that produces college-career and citizen-ready high school graduates. State and national organizations are calling for a strong foundation in mathematical literacy and the ability to apply it in pre-K through grade 12, for all students, because it is paramount to workforce productivity, economic stability, and social justice for each and every student (NCTM, 2020).

> **I know we are going to build teachers' capacity, but not only are we going to build it, we are going to sustain it, because we get to say, what is the next best question we can ask and try to solve it.**
>
> **School principal in the Transformation Zone**

### Limitations

Although promising results for schools implementing the State Systemic Improvement Plan and Kentucky's mathematics innovation have emerged from the external evaluation, there are notable limitations. Schools were not randomized to participate; thus, the evaluation represents a quasi-experimental design. Although comparable non-TZ schools were selected, without randomization it is possible that TZ schools implementing the State Systemic Improvement Plan differed in meaningful ways from the comparison schools and these potential differences could have influenced the results. Also, the K-PREP data was aggregated at the school-level and did not allow for the direct analysis of student-level data nested within schools, which could result in lower estimates of the true effects.

### Implications

The research is clear – the quality of teachers' instructional practice in the classroom is the largest factor in teaching mathematics for closing long standing deficits and disparities in student outcomes (Harper, 2019; Hattie, 2003; NCTM, 2020). Without a measure of instructional practice and follow-up feedback, teachers cannot learn and transfer new skills to their instructional practice (McKenna & Parenti, 2017), nor can the teams responsible for effective implementation understand if there is a lack of standardized processes (Hill & Erickson, 2019) such as protocols for teams to use data and tools for decision making (March et al., 2016) or adequate and equitable resourcing (i.e., ongoing training and coaching based on context and need). These strategies are all necessary to ascertain whether effectiveness, or lack thereof, is attributed to treatment fidelity or other contextual factors (Archibald et al., 2011; LeMahieu et al., 2017; Proctor et al., 2013). A deeper understanding of the variables responsible for the continuous development of educators' effective instruction and implementation capacity will further inform the gap between research and practice that implementation methods can fill (Allor & Stokes, 2017; Fixsen et al, 2013).

# Appendix

To evaluate the effectiveness of the State Systemic Improvement Plan (SSIP) implemented in Kentucky's TZ districts and their schools, an external evaluation team conducted a quasi-experimental comparison of 33 TZ schools and non-TZ schools. They compared schools on the Kentucky Performance Rating for Educational Progress (K-PREP) publicly available data. The evaluation team compared data from the 2015-16 and 2018-19 school years.

### Data analysis

Fixed-effects linear gain models tested change across time in the percent of students in each of the K-PREP math categories (novice, apprentice, and proficient and distinguished). The category scores from the 2015-2016 school year were set as the intercept and the 2018-2019 category scores as the endpoint. The models included an intercept (defined as the 2015-2016 math category scores), the main effect of Group (coded 1 for TZ schools and 0 for non-TZ schools), Time, and the interaction of Group × Time. The Group × Time interaction term is a test of the effectiveness of the TZ schools implementing the State Systemic Improvement Plan to improve student math outcomes relative to the comparison non-TZ schools under the assumption that other systematic factors had not caused those differences. The 33 schools available for the analyses lacked statistical power to detect potentially meaningful group differences as statistically significant. Thus, Group × Time estimates were reported as d statistics (Feingold, 2009), which were used to evaluate the efficacy of the TZ schools implementing the State Systemic Improvement Plan relative to the matched non-TZ schools.

Models were run separately for Grades 3 to 5 and Grades 6 to 8. Within each grade, estimates were obtained separately for students with both a disability and an IEP, Black students, and all students. Due to limited data, separate estimates for Black students could not be estimated for 3rd to 5th grade. All models were estimated with the SAS software (Version 9.4) using maximum likelihood methods.

**Tables 1-3**, starting on the next page, provide the K-PREP category means and standard deviations for students with disabilities and an IEP, for Black students, and for all students, respectively. Tables 4-6 provide results from the fixed effects gain models for 3rd- to 5th-grade students for novice, apprentice, and proficient and distinguished math categories, respectively. **Tables 7-9** provide results from the fixed effects gain models for 6th- to 8th-grade students for novice, apprentice, and proficient and distinguished math categories, respectively. **Table 10** provides a summary of all the effect size estimates for the Group × Time interactions (Cohen, 1988).

**TABLE 1.**

| K-PREP Means and Standard Deviations for Students with a Disability and an IEP | Novice (%) | | | | Apprentice (%) | | | | Proficient & Distinguished (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | |
| | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD |
| Grades 3-5 | | | | | | | | | | | | |
| TZ schools | 47.3 | 9.9 | 35.4 | 17.3 | 31.2 | 14.9 | 34.8 | 12.7 | 21.4 | 8.3 | 29.8 | 12.4 |
| Non-TZ schools | 48.1 | 15.6 | 49.0 | 15.4 | 34.1 | 13.7 | 31.4 | 9.2 | 17.9 | 11.6 | 19.7 | 11.6 |
| Grades 6-8 | | | | | | | | | | | | |
| TZ schools | 51.3 | 14.3 | 45.0 | 14.7 | 36.6 | 13.6 | 39.2 | 12.5 | 12.1 | 10.0 | 15.8 | 14.0 |
| Non-TZ schools | 48.1 | 12.8 | 41.0 | 16.3 | 38.1 | 11.5 | 48.6 | 14.9 | 13.8 | 06.8 | 10.4 | 6.2 |

M = mean, SD = standard deviation, TZ = transformation zone.

**TABLE 2.**

| K-PREP Means and Standard Deviations for Black Students | Novice (%) | | | | Apprentice (%) | | | | Proficient & Distinguished (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | |
| | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD |
| Grades 3-5 | | | | | | | | | | | | |
| TZ schools | 40.7 | 22.6 | --- | --- | 31.3 | 14.9 | --- | --- | 28.0 | 17.0 | --- | --- |
| Non-TZ schools | 33.3 | --- | 35.4 | 8.1 | 50.0 | --- | 38.7 | 13.0 | 16.7 | --- | 26.0 | 17.5 |
| Grades 6-8 | | | | | | | | | | | | |
| TZ schools | 35.7 | 12.7 | 34.9 | 14.1 | 41.0 | 8.4 | 44.6 | 14.2 | 23.3 | 12.5 | 20.5 | 11.7 |
| Non-TZ schools | 24.1 | 16.2 | 39.6 | 19.7 | 41.9 | 10.7 | 41.0 | 12.8 | 34.0 | 16.6 | 19.5 | 11.1 |

M = mean, SD = standard deviation, TZ = transformation zone.

**TABLE 3.**

| **K-PREP Means and Standard Deviations for All Students** | Novice (%) | | | | Apprentice (%) | | | | Proficient & Distinguished (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | | 2015-2016 | | 2018-2019 | |
| | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** |
| Grades 3-5 | | | | | | | | | | | | |
| TZ schools | 23.6 | 7.2 | 21.6 | 7.4 | 30.6 | 7.0 | 33.1 | 6.7 | 45.8 | 9.5 | 45.3 | 12.2 |
| Non-TZ schools | 14.7 | 9.2 | 16.4 | 7.9 | 30.6 | 9.2 | 29.2 | 7.7 | 54.7 | 15.6 | 54.4 | 13.8 |
| Grades 6-8 | | | | | | | | | | | | |
| TZ schools | 21.9 | 9.7 | 20.3 | 9.2 | 36.3 | 8.9 | 39.5 | 11.4 | 41.9 | 14.7 | 40.3 | 15.7 |
| Non-TZ schools | 12.9 | 8.1 | 13.9 | 12.4 | 31.9 | 8.2 | 35.7 | 7.9 | 55.2 | 15.3 | 50.4 | 18.7 |

M = mean, SD = standard deviation, TZ = transformation zone.

**TABLE 4.**

| **Results of Fixed Effects Gain Models for 3rd-5th Grade Novice in Math** | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .483 | .030 | 16.06 | <.001 |
| Group | .017 | .066 | 0.25 | .804 |
| Slope | .006 | .033 | 0.18 | .856 |
| Group × time | -.133 | .068 | -1.94 | .056 |
| All students | | | | |
| Intercept | .147 | .018 | 8.19 | <.001 |
| Group | .108 | .040 | 2.67 | .017 |
| Slope | .017 | .013 | 1.31 | .193 |
| Group × time | -.041 | .027 | -1.55 | .125 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = -.47 and for students with a disability d = -.90.

**TABLE 5.**

| **Results of Fixed Effects Gain Models for 3rd-5th Grade Apprentice in Math** | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .339 | .022 | 15.20 | <.001 |
| Group | -.036 | .047 | -0.76 | .456 |
| Slope | -.025 | .027 | -0.91 | .367 |
| Group × time | .064 | .056 | 1.14 | .260 |
| All students | | | | |
| Intercept | .306 | .017 | 17.51 | <.001 |
| Group | .026 | .039 | 0.67 | .515 |
| Slope | -.014 | .013 | -1.06 | .291 |
| Group × time | .035 | .027 | 1.32 | .191 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = .40 and for students with a disability d = .46.

**TABLE 6.**

| **Results of Fixed Effects Gain Models for 3rd-5th Grade Proficient & Distinguished in Math** | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .181 | .023 | 7.72 | <.001 |
| Group | .027 | .052 | 0.52 | .611 |
| Slope | .017 | .024 | 0.71 | .479 |
| Group × time | .067 | .050 | 1.36 | .172 |
| All students | | | | |
| Intercept | .547 | .033 | 16.52 | <.001 |
| Group | -.144 | .073 | -1.97 | .067 |
| Slope | -.003 | .018 | -0.18 | .853 |
| Group × time | .009 | .038 | 0.24 | .809 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = .06 and for students with a disability d = 62.

**TABLE 7.**

| Results of Fixed Effects Gain Models for 6th-8th Grade Novice in Math | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .481 | .051 | 9.48 | <.001 |
| Group | .044 | .060 | 0.73 | .477 |
| Slope | -.071 | .039 | -1.82 | .072 |
| Group × time | .017 | .046 | 0.36 | .722 |
| Students who are Black | | | | |
| Intercept | .234 | .057 | 4.14 | .002 |
| Group | .129 | .068 | 1.91 | .083 |
| Slope | .113 | .056 | 2.04 | .046 |
| Group × time | -.116 | .063 | -1.84 | .071 |
| All students | | | | |
| Intercept | .129 | .041 | 3.09 | .008 |
| Group | .102 | .050 | 2.05 | .058 |
| Slope | .010 | .016 | 0.60 | .551 |
| Group × time | -.020 | .019 | -1.05 | .298 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = -.21, for students who are Black d = -.85, and for students with a disability d = 12.

**TABLE 8.**

| Results of Fixed Effects Gain Models for 6th-8th Grade Apprentice in Math | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .381 | .041 | 9.32 | <.001 |
| Group | -.010 | .049 | -0.21 | .833 |
| Slope | .105 | .042 | 2.52 | .014 |
| Group × time | -.082 | .049 | -1.66 | .101 |
| Students who are Black | | | | |
| Intercept | .419 | .034 | 12.32 | <.001 |
| Group | -.009 | .040 | -0.23 | .820 |
| Slope | -.009 | .054 | -0.17 | .863 |
| Group × time | .046 | .062 | 0.73 | .466 |
| All students | | | | |
| Intercept | .319 | .035 | 9.20 | <.001 |
| Group | .055 | .041 | 1.34 | .199 |
| Slope | .039 | .025 | 1.55 | .125 |
| Group × time | -.006 | .029 | -0.20 | .842 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = -07, for Students who are Black d = .51, and for students with a disability d = -.63.

**TABLE 9.**

| **Results of Fixed Effects Gain Models for 6th-8th Grade Proficient & Distinguished in Math** | *Estimate* | *SE* | *t-value* | *p-value* |
|---|---|---|---|---|
| Students with Disability & IEP | | | | |
| Intercept | .138 | .032 | 4.25 | <.001 |
| Group | -.031 | .038 | -0.81 | .431 |
| Slope | -.033 | .033 | -1.22 | .312 |
| Group × time | .067 | .039 | 1.71 | .091 |
| Students who are Black | | | | |
| Intercept | .349 | .050 | 7.01 | <.001 |
| Group | -.126 | .060 | -2.11 | .059 |
| Slope | -.105 | .050 | -2.10 | .040 |
| Group × time | .074 | .057 | 1.30 | .199 |
| All students | | | | |
| Intercept | .552 | .067 | 8.35 | <.001 |
| Group | -.159 | .079 | -2.02 | .062 |
| Slope | -.048 | .027 | -1.82 | .072 |
| Group × time | .026 | .031 | 0.82 | .412 |

SE = standard error. The group × time estimate for all students associated with Cohen's d = .17, for students who are Black d = 54, and for students with a disability d = .73.

**TABLE 10.**

**Effect Size Estimates (Cohen's d) for Group × Time Interactions.**

| | *Grades 3-5* | *SE* |
|---|---|---|
| Proficient and Distinguished | | |
| All students | .06 | .17 |
| Students who are Black | -- | .54 |
| Students with a disability and IEP | .62 | .73 |
| Apprentice | | |
| All students | .40 | -.07 |
| Students who are Black | -- | .51 |
| Students with a disability and IEP | .46 | -.63 |
| Novice | | |
| All students | -.47 | -.21 |
| Students who are Black | -- | -.85 |
| Students with a disability and IEP | -.90 | .12 |

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