A Case Study of Teachers and their Instructional Practices with the Istation Reading Program

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Istation

Research Project Title:

A Case Study of Teachers and their Instructional Practices with the Istation
Reading Program

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*The following report describes the findings of a case study (consisting of multiple
teachers in two states) of teachers' practices using the Istation program.*

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Introduction

In K-12 teaching and learning literature, teachers have been deemed the most influential factor in the classroom (Hattie, 2008). A teacher's self-efficacy for instructional approaches and content knowledge influences the way content is taught and the frequency with which that content is taught (Bandura, 1982; Zee & Koomen, 2016; Poulou et al., 2019). Moreover, teachers' pedagogical and content knowledge are known factors that can influence student achievement (Gess-Newsome et al., 2019).

Pedagogical approaches are often informed by student data. Evidence of students' knowledge and skills may be what the teacher observes directly, like listening to a child read, or examining students' formative or summative assessment. Data-driven instructional decisions are then based on evidence collected and analyzed. Utilizing a computer-adaptive reading program (CARP) like the Istation reading program can provide teachers with real-time data to adjust instruction to address academic deficits (e.g., knowledge and skills) and to capitalize on students' strengths. By knowing there are learning gaps, a teacher is best positioned to support their students' reading achievement.

For this reason, the Research in Innovations in Education (RIE) group conducted a study in two states to answer the following research questions:

> RQ1. How are the online interactions of Elementary teachers related to students' achievement in reading as measured by mean gains from the first to last assessment?

> RQ2. How do teachers utilize data-analytics provided by the Istation teacher dashboard?

Context of the Study

Two Districts in Two STATEs

Data for the study was obtained from two school districts in two states, a mid-Atlantic state and a southwestern state (see Table 1).

STATE A

In the mid-Atlantic state, the mostly rural school district serves more than 10,000 students at 13 elementary schools, four middle schools, four high schools, and a technical learning center (National Center for Education Statistics [NCES], 2018). Of the reported student population, 62.04% of students identify as White, 18.81% describe themselves as Hispanic, 10.76% identify themselves as Black, and 2.50% identify as Asian. Fifty-one percent of students identify as

male, while the remaining 48.76% identify as female. Across the district, 46.28% of the students qualify for free or reduced-price lunch.

STATE B

In the southwestern United States, this school district serves 3,072 K-12 students and 2,370 Kindergarten through eighth grade students. The district contains nine schools, including one pre-school, four elementary schools, two combined elementary and middle schools, one middle school, and one high school. Based on the district report card for the 2017-2018 academic year, 49.3% of students in the district identify as female, while 50.7% identify as male. Of the students, 27.7% are English Language Learners and 16.1% are classified as students with disabilities, not including students designated as gifted. Further, 27.7% of students are classified as "Recently Arrived" students, indicating that they are new to the U.S. school system and are qualified for exemptions from reading assessments and 100% of students are considered to be economically disadvantaged, with all students qualifying for free or reduced-price lunch. The majority (88%) of the students in the district belong to racial and ethnic minority groups.

Table 1

Enrolled Students by STATE A

Grade	**STATE** A District District Enrolled Students by Grade	**STATE** B District Students Enrolled at Schools Observed
Pre-K	119	-
Kindergarten	993	259
First	958	262
Second	954	248
Third	989	242
Fourth	1,037	260
Fifth	1,050	254
Sixth through Eighth	----	735
Total	6,100	2,260

Selection of Schools

STATE A

The schools of the teachers represented in the case study from **STATE A** were representative of the school district in that two elementary schools were considered high performing and two were considered non-high performing schools based on the prior school years' state achievement scores. The schools represented the geographical locales of the district (see Table 2).

Table 2

School Information for STATE A

	Title I	Performance	Locale
Elementary School A	Yes	Low	Rural: Fringe
Elementary School B	Yes	High	Rural: Fringe
Elementary School C	No	High	Rural: Fringe
Elementary School D	Yes	Low	Rural: Fringe

STATE B

The schools of the teachers represented in the case study from **STATE B** were representative of the school district in that all of the schools were Title I schools and all students qualified for free lunch status. Teachers from all of the district schools were considered (See Table 3).

Table 3

School Information for STATE B

	Title I	Locale
Elementary School A	Yes	Rural: Fringe
Elementary School B	Yes	Suburb: Large
Elementary School C	Yes	Rural: Fringe
Elementary School D	Yes	Suburb: Large
Elementary School E	Yes	Rural: Fringe
Elementary School F	Yes	Rural: Distant
Middle School A	Yes	Rural: Distant
Middle School B	Yes	Suburb: Large

Note. Performance ratings by district were unavailable

Methodology

A mixed methods exploratory study was conducted to investigate the impact of teachers' interaction with Istation and the resulting impact on their students' achievement.

Participants

There were two groups of participants: teachers and students. The participants were from two states which are referenced as **STATE A** and **STATE B** throughout the study. Descriptions of the participants are found in the context of the study. Purposive sampling was used to identify teachers based on gain scores. Students of the selected teachers for the case study evidenced higher gains than comparable teachers at the same grade-level in the district.

Data Sources

Raw post de facto data for the study was provided by Istation and compiled from three sources: (a) student achievement data from the Istation Indicators of Progress (ISIP) assessment component, (b) student usage data from the curriculum component of Istation and, (c) teacher data interactions with the platform.

Student Data: Student achievement data was analyzed for evidence of growth over time by calculating a simple gain score. The score of students' first assessment was subtracted from the score of their final assessment to calculate the gain scores. Overall scores were used to capture overall reading growth inclusive of comprehension and vocabulary. Likewise, student usage data was divided into three categories: (a) school usage of curriculum, (b) assessment usage, and (c) home usage. Student usage was one metric that characterized teachers' fidelity. Istation recommends that students complete 30 minutes or more of curriculum usage each week which on average is 900 minutes for the school year. However, a recent study by Istation indicated that on average 45 minutes per month of use of the supplemental curriculum may be indicative of good implementation for students in Kindergarten through Second grade (Patarapichayatham & Locke, 2019).

Teacher Usage Data: Teacher usage data was derived from all the interactions a teacher has with Istation Teacher Dashboard. Teachers log in to a dashboard and can view data analytics, curricular and instructional resources, and training modules and videos. All interactions are recorded and were analyzed to determine teachers' use. Additionally, students' use of the CARP Istation Reading was considered as it was indicative of a teacher demonstrating high fidelity of use in that the teacher consistently scheduled and followed the recommended minutes of the Istation reading program guidelines.

The Procedure of the Study

Data was collected during 2018-2019. **STATE A'**s data was from the 2018-2019 school year (August through May) and **STATE B'**s data was from the Fall semester of the 2019 school year (August through December). All student data was matched and cleaned to remove those who did not have at least three assessments. All teacher data were included. Then student and teacher data were matched on the teachers deidentified id's.

In the case of **STATE B,** observational data were considered to provide contextual information of model teachers' practices regarding how Istation was implemented

Data Analysis

Changes in students' reading achievement from the first assessment of the year to the last assessment of the school year within the distinct groups (classes) were examined by calculating paired sample t-tests, independent samples t-test, and Cohen's d. Descriptive statistics for teachers' interactions were calculated to determine teachers' usage.

Findings

STATE A - Elementary characterized by Early Reading, (ER), and Advanced Reading, (AR). To understand how teachers' online interactions and use of data analytics are related to student achievement, teachers with high fidelity were first identified by comparing mean gains by

teacher. Table 4 presents the results of the independent sample t-tests comparing the gains of a high-fidelity teacher's third-grade students and (a) other third graders at the schools where fidelity observations took place, (b) a random sample of other third graders in the District, and (c) other third graders at unobserved schools. There were significant differences between the gains of the high fidelity teacher's third grade students (n = 60, M = 23.48; SD = 10.28) and (a) other third grade students at the same fidelity school (n = 264, M = 19.47; SD = 5.06), (b) a random sample of other third graders in the district (n = 115, M = 18.99; SD = 8.81); (c) and other third graders at unobserved schools in the district (n = 116, M = 18.53; SD = 7.43). On average, students of high-fidelity teachers evidenced higher gains from assessment 1 to 4 than the other examined groups. The effect sizes for these comparisons ranged from 0.47 to 0.55. These effect sizes are considered medium and indicate on average that the effect of this high-fidelity teacher on students' achievement may account for 19-21 percentile points difference (Marzano, Pickering, & Heflebower, 2011).

Table 4

Third Graders' Comparative Gains from Assessment 1-4

High Fidelity Teacher's Third Grade Students		Other Third Graders at Elementary School A		$t(df)$	p	d
M	SD	M	SD			
23.48	10.28	19.47	5.06	-2.04 (59)	.046[a]	0.49
High Fidelity Teacher's Third Grade Students		**Other Third Graders at Fidelity Schools**		$t(df)$	p	d
M	SD	M	SD			
23.48	10.28	18.99	8.81	-2.01 (263)	.045[b]	0.47
High Fidelity Teacher's Third Grade Students		**Random Sample of Other Third Graders in District**		$t(df)$	p	d
M	SD	M	SD			
23.48	10.28	18.53	7.43	-2.97 (114)	.004[b]	0.55
High Fidelity Teacher's Third Grade Students		**Other Third Graders at Unobserved Schools**		$t(df)$	p	d
M	SD	M	SD			
23.48	10.28	19.58	9.45	-1.68 (115)	.085	0.49

Note. [a]p <.05; [b]p <.005

Table 5 presents the results of the independent sample t-tests comparing the gains of a selected high-fidelity teacher's fourth grade students and (a) other fourth graders at the same fidelity schools, (b) a random sample of other fourth graders in the district, and (c) other fourth graders at unobserved schools. There was a significant difference in the gain scores (from assessment 1-4) between the students of a high fidelity fourth grade teacher ($n = 60$, $M = 207.43$; $SD = 98.64$) and (a) other fourth graders at the same elementary school ($n = 284$, $M = 170.26$; $SD = 69.69$), (b) other fourth grade students at observed fidelity schools ($n = 122$, $M = 182.03$; $SD = 80.49$); and (d) other fourth graders at unobserved schools ($n = 758$, $M = 170.21$; $SD = 78.92$). There was no significant difference between the gains of students from the high-fidelity teacher and a random sample of other fourth grade students in the district; however, overall, students of the high-fidelity teacher evidenced on average higher gains from assessment 1 to 4 than the other examined groups. The effect sizes for these comparisons ranged from 0.28 to 0.52. These effect sizes are considered small to medium and indicate on average that the effect of this high-fidelity teacher on students' achievement (as measured by mean gains) may account for 11-20 percentile points difference (Marzano, et al., 2011).

Table 5

Fourth Graders' Comparative Gains from Assessment 1-4

High Fidelity Teacher's 4th Grade Students		Other 4th Graders at Elementary School A		t(df)	p*	d
M	SD	M	SD			
207.43	98.64	163.14	66.93	-2.83 (110)	.005	0.52

High Fidelity Teacher's 4th Grade Students		Other 4th Graders at Fidelity Schools		t(df)	p	d
M	SD	M	SD			
207.43	98.64	170.26	69.69	3.03 (283)	.003	0.44

High Fidelity Teacher's 4th Grade Students		Random Sample of Other 4th Graders in District		t(df)	p	d
M	SD	M	SD			
207.43	98.64	182.03	80.49	-1.55 (121)	.125	0.28

High Fidelity Teacher's 4th Grade Students		Other 4th Graders at Unobserved Schools		t(df)	p	d
M	SD	M	SD			
207.43	98.64	170.21	78.92	2.99 (757)	.003	0.42

Note. *p <=.005

Teachers' use of online curricular and progress monitoring resources were investigated to identify effective teacher practices to support student reading growth on the Istation program. Case-by-case analysis showed that teachers with higher gains were defined by three key characteristics. First, high-fidelity teachers consistently used the Istation teacher dashboard and reports system to access student-generated formative assessment data. On average, students' data through the various available reports were accessed a minimum of two times per month.

Second, these teachers used the "on-demand" student assessment function monthly throughout the year. The on-demand assessment feature gives teachers the ability to immediately assign a student an assessment outside the normal cycle. Real-time data from on-demand assessments afford immediate guidance to make instructional pivots to personalize instruction. Third, teachers with high-fidelity ensured that their students met the minimum number of minutes recommended by the Istation program with consistent monthly usage patterns over the designated time period (see Figure 1).

Figure 1

Profile of a Teacher with High-Fidelity using the Istation Reading Program
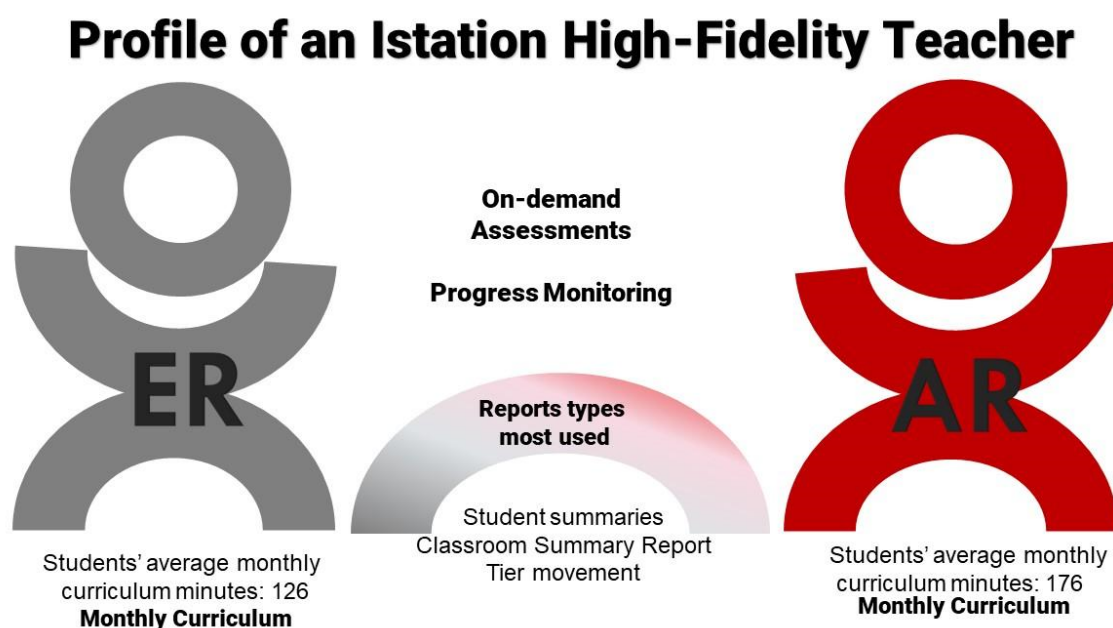
For example, the third-grade high fidelity teacher profiled above whose students demonstrated higher mean gains between assessment one (beginning of the year) and assessment four (end of the year) made frequent use of student summaries and classroom summary reports, assigned on-demand assessments, and ensured students used 126 minutes of curriculum per month, on average. Similarly, the fourth-grade high fidelity teacher profiled above also accessed classroom summary reports, monitored students' tier movement, and used the filter function to create targeted reports. The high-fidelity AR teacher assigned on-demand assessments

throughout the school year and promoted a monthly curriculum usage above the recommended amount.

STATE B

To further understand how teachers' interactions by grade level differ by grade level and not just by the ISIP assessments divisions Early Reading (ER; Kindergarten through Third grade) and Advanced Reading (AR; Fourth through Eighth grade), **STATE B**'s data was investigated by grade and by usage. Table 6 presents the descriptive statistics of curriculum usage from August through December for high versus low usage classes. For instance, for Kindergarten, a high usage class was identified with an average curriculum usage of almost 890 minutes for the months of August through December, averaging 222 minutes a month, whereas a low usage class was identified with an average curriculum usage of 165 minutes for the months of August through December, averaging approximately 40 minutes a month, which is below the recommended monthly minutes.

Table 6

Descriptive Statistics of Curriculum Minutes

	High Usage					Low Usage				
	n	*Min.*	*Max*	*M*	*SD*	*n*	*Min.*	*Max*	*M*	*SD*
Kindergarten	13	790.33	1103.63	**890.96**	85.25	13	0	327.12	**165.47**	92.64
Grade 1	16	424.55	624.07	**519.79**	60.28	17	32.95	453.32	**162.87**	89.96
Grade 2	23	254.70	1034.37	**656.61**	177.91	18	0	4.15	**1.38**	1.13
Grade 3	29	304.52	879.30	**690.75**	152.38	22	117.02	505.43	**199.53**	84.43
Grade 4	18	370.65	698.38	**570.29**	84.44	21	2.45	121.65	**48.62**	34.44
Grade 5	19	321.13	827.58	**493.50**	119.30	19	29.7	311.05	**211.58**	66.80

Table 7 presents the results of the paired sample t-tests for the assessments August and December for students with *high* usage. For instance, scores for Kindergarten students with high curriculum usage (see Table 6) significantly increased from an average of 170.61 points in the August assessment to 188.10 points in the December assessment indicating an average increase of 17.49 points.

Table 7

Results of Paired Sample t-test in the Assessments August and December for High Usage Students

	August		December		Gains				
	M	SD	M	SD	Mean Diff	t	df	p	d
Kindergarten	170.61	10.92	188.10	19.23	17.49	-3.37	12	0.006	1.12
Grade 1	203.26	13.43	210.24	14.00	6.98	-4.52	15	0	0.51
Grade 2	212.02	15.33	221.08	13.97	9.06	-6.76	21	0	0.62
Grade 3	233.66	12.82	238.17	13.46	4.51	-3.41	26	0.002	0.34
Grade 4	1803.01	93.25	1846.77	101.02	43.76	-2.62	17	0.018	0.45
Grade 5	2000.97	183.02	2035.01	199.11	34.04	-1.03	19	0.331	0.18

Table 8 presents the results of the paired sample t-tests for the assessments August and December for students with *low* usage. For instance, fourth grade students with high curriculum usage gain, on average, 15 points (compared to 43.76 points for fourth grade students with *high* curriculum usage) from the August to December assessment. This increase in points for fourth grade students with low curriculum usage is not statistically significant ($p = 0.058$).

Table 8

Results of Paired Sample t-test in the assessments August and December for low usage students

	August		December		Gains				
	M	SD	M	SD	Mean Diff	t	df	p	d
Kindergarten	164.35	12.48	174.21	11.87	9.87	-2.26	9	0.054	0.81
Grade 1	183.57	15.08	197.95	15.65	14.38	-2.60	11	0.25	0.94
Grade 2	210.85	11.30	221.04	17.40	10.19	-2.99	8	0.017	0.69
Grade 3	242.26	17.02	249.18	17.37	6.92	-3.84	20	0.001	0.40
Grade 4	1736.20	116.45	1751.71	112.62	15.52	-0.88	20	0.392	0.14
Grade 5	1832.24	114.74	1811.65	130.01	-20.59	0.91	14	0.38	0.17

Use of Istation Reports related to Student Achievement

To answer research question two, observations were conducted on-site in both states. Further, informal and formal interviews were conducted to answer this research question. In the schools

in **STATE B** it was common to see that teachers utilized their students' Istation results to positively affirm students' reading growth (see Figure 2).

Figure 2

*Reward Wall for Istation Growth on the ISIP Assessment*

Teachers often noted that they used the data in grade-level planning and professional learning communities to improve the reading achievement at their school. It was common to see literacy planning walls. Teachers met weekly to plan instruction and monthly they charted students' progress and instructional goals as indicated from the monthly assessment (see Figure 3). The visuals afforded teachers opportunities to view the school as a whole and by grade level. After reviewing the monthly formative assessment, teachers moved their students to different achievement levels. Lessons for small group instruction were planned and further one-on-one interventions were determined based on the reviewed data.

In **STATE A**, these same behaviors were consistently evidenced at Title I schools. Teachers met with their instructional leaders and planned instruction based on the data-analytics generated by the Istation reading program. These actions are indicative of teachers using data to plan instruction.

"The more my students see their own progress the more they want to change it and they know they have the power to change it if they focus and work hard." - A third grade teacher

Figure 3

Instructional Goals Planning Wall
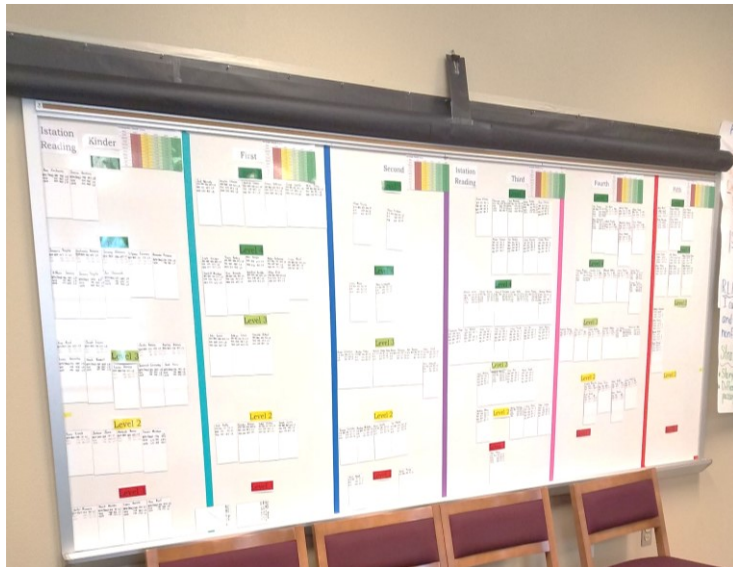
On-site Interviews

Based on interviews conducted with kindergarten, first-grade, and fifth-grade instructors and school literacy coaches, participants reported the primary uses of Istation as: (a) regular assessments of students, (b) reviewing data to monitor their students' progress, (c) using data to implement reading interventions with students, and (d) addressing students' reading achievement with parents. Literacy coaches addressed their role as largely facilitative of instructors' and students' needs, often working with teachers to support their use of the program through providing training and information when needed. All of the interviewees indicated that they utilized the Istation data to provide student incentives and visual strategies to show growth and improvement. Moreover, teachers indicated that they printed a summary score for all of their students and shared them with parents monthly.

Spotlight: Highlighting the Case of a Special Education Teacher

In **STATE B**, observers noted the particularly illustrious case of a special education teacher whose daily instruction was aligned with Istation goals and incorporated motivational and progress monitoring components into the assessment process. Her lesson included an opening activity designed to stimulate student thinking and encourage students that they can "use their brains" to solve problems. The teacher transitioned to the assessment by directing students to their weekly and daily learning goals, explaining that the assessment is an opportunity to show what they have learned. A PowerPoint slide displayed on the classroom Smart Board described incentives for students who showed progress on the day's assessment (e.g. 5 Eagle Bucks that could be used later to buy something in the classroom store). As students finished, the teacher individually reviewed reports with each student to celebrate progress and identify areas for further practice.

Throughout the classroom were visuals praising student success on Istation and connecting Istation components to larger learning goals. Given evidence that interventions that change daily reading instruction are most effective at raising reading achievement (Slavin et al., 2009), this case is presented as one way that teachers may incorporate processes related to Istation curriculum and assessment into daily instructional activities.

Discussion

Prior research regarding teachers' interactions with CARP and the impact on achievement have been limited (Kamil and Chou, 2014). In this novel study, the researchers began to encode how teachers' interactions statistically correlate to students' reading achievement. It was determined that generally teachers with high-fidelity for using the program students have achievement scores that are higher than those who do not evidence high-fidelity.

There are three categories of teacher fidelity based on teacher interactions and behaviors that were discovered in our study. First, there is the high-fidelity teacher who uses reports and curricula resources, employs on-demand assessments as needed (a marker that they are carefully tracking their students' reading development), and whose students use the CARP for the recommended times. Next, there are teachers with low-fidelity use. These teachers may use the teacher dashboard program one time a month and typically have low-student usage of the online curriculum. There are also teachers with mid-fidelity who access the teacher portal multiple times a month, whose students have little to no compliance using the online curriculum but use the Istation curricular resources found in the teacher dashboard for small groups and individual instruction. In this study, we looked at teachers who were categorized with low- and high fidelity. However, future research related to teachers' fidelity of use of Istation should seek to understand factors related to teachers who exhibit mid-fidelity of use.

The data-analytics that teachers accessed supported parent-teacher conferences, goal setting with students, and teacher planning. Teachers remarked that they brought a print-out of their students' reading scores to share with parents while others were more proactive and shared the data with all parents monthly. Partnering with parents by regularly providing student achievement information about their students has been deemed a helpful practice in improving student achievement (Christenson, 2004; Fan & Chen, 2001; Sadiku & Sylaj, 2019). Goal setting did not occur with every teacher in either state, but it was noted that the teachers that did share learning goals with students felt it motivated their students to do better on their monthly assessments as they shared responsibility in developing as a reader (Ames & Archer, 1988; Green & Miller, 1996; Smithson, 2012).

Limitations

A general limitation in observational studies is the intentions of the students are not known (Anderson & Arsenault, 2005). While we observed the use of the program in both of these states multiple times, we cannot be assured that even though the students were on the computer to use the program (minutes of use) that the students were engaged during each of those minutes. However, our field observations generally indicated that students were mostly engaged in the program when they were using it during our observations.

Limitations of this study for **STATE B** relate to district characteristics. First, not all schools had consistent student attendance due in part to cultural events, community activities, and facility

barriers. As an example, during a district visit, we arrived at one school to find less than 3% of the students were in attendance. The school had been notified that morning that the students would not be attending school due to an unscheduled cultural event. In another instance, technical difficulties (i.e., plumbing) kept students out of school for more than a week. Further, online connectivity issues kept students from accessing the online program. These common barriers influence sustainability of use of the program. If it is difficult to access resources, a teacher may be less likely to continue to persist impacting their intention for use of the technology (Ajzen, 1991). Future studies could include information about challenges and barriers to consistent use.

Conclusion

In conclusion, a mixed methods case study of teachers' use of the Istation program and its impact on students' achievement was conducted in two states to determine how teachers level of fidelity contributed to student achievement. A framework for determining high and low levels of teacher fidelity were established. The findings indicated that the selected teachers who had high levels of fidelity had greater student achievement (as evidenced by students' mean gain reading scores on the ISIP achievement) than comparative teachers who were categorized as low-fidelity users. Moreover, how teachers operationalized the data-analytics of the program advances knowledge for all educational stakeholders of how data is used beyond instructional planning with students, other teachers, and families. However, further research should be conducted to determine if there are other factors beyond the teachers' interactions with the program that may contribute to how and why teachers use the Istation program resources and the influence of factors on student achievement.

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