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# Multi-State, Quasi-Experimental Study of the Impact of Internet-Based, On-Demand Professional Learning on Student Performance

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**ABSTRACT**

This multi-State, quasi-experimental study reflects the quantification of comparative gains in math and reading performance on standardized assessments. We contrasted performance in consecutive years pre-versus-post for students of teachers actively participating in an Internet-based, on-demand professional development (PD) program with their respective districts, thus normalizing for uncontrolled educational and socioeconomic variables. A random sample of 169 schools was analyzed representing teachers with a minimum high-participation level in PD. Results showed that students of participating teachers experienced 18.9% increases ($p<.001$) in math scores versus 4.2% ($p<.01$) for their districts, and 15.3% increases ($p<.001$) in reading versus 2.5% ($p<.01$) for their districts, equating to statistically significant 4.2 fold ($p>.001$) and 6.1 ($p>.001$) fold advantages, respectively. Findings support the high-participation use of Internet-based, on-demand professional learning for improving teacher effectiveness to impact student performance.



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## 1. INTRODUCTION

One major purpose of professional learning, of which professional development (PD) is a fundamental component, is to continuously enhance the efficacy and impact for classroom teachers [1]. Some recent research findings have been supportive of PD for showing general improvements attributed to levels of participation [2]-[8]. Additionally, level of active versus passive PD participation, such as videos and workshops versus passive video alone, has been associated with impact [4];[5];[9]-[11]. This nuance of the level of participation as a predictor of impact will become increasingly important as cost-effective, technology-based delivery models become more commonplace [12]-[15].

In research outside of the educational arena, timely learning synchronized with interest and need (such as on-demand personalized professional development) has been labeled as "just-in-time (JIT) learning". JIT approaches in manufacturing maximize efficiency, profitability, and efficacy while minimizing costs associated with doing business [16]-[19]. On-demand, Internet-based approaches to PD as part of professional learning mirror such JIT approaches, enabling educators to benefit from access to what they believe they need, when they need it.

More studies are needed to quantify and establish a compelling link between PD and objective measures of student performance to verify and quantify the efficacy of the PD model in education [2]-[7]. At

least one recent study cited a "dearth of scientific research … on whether changes in teachers' knowledge and instructional practices resulting from online professional learning are linked to changes in students' knowledge and practices" [20]. The struggle to identify a link between PD participation and student achievement is maybe attributed to the methodological challenge of applying rigorous a-priori research designs and techniques: Randomly assigning statistically-matched teachers and students to treatment groups is not realistic or ethical in the real-world of public education, the settings where the correlation of PD participation and students performance is arguably the most urgent.

The purpose of this research was to leverage quasi-experimental techniques to quantify improvements in student performance on standardized tests concurrent with high teacher participation in Internet-based, on-demand evidence-based PD with a large-scale sample [21]. This multi-state study contrasts student performance for schools with teachers participating substantively in PD with those of their respective districts for the same time periods in a pre-versus-post with districts acting as historical control groups.

## 2. RESEARCH METHOD

Study design reflected a quasi-experimental approach contrasting pre-PD versus post-PD and participation versus non-participation, with the main measure being quantification of change in student performance. PD participation was defined as use of the commercially-available PD product (PD 360 ® and Observation 360 ®, School Improvement Network, Salt Lake City). The PD product is best defined as an on-demand, Internet-accessible product suite through which educators can participate in a full range of passive and active capabilities, ranging from viewing instructional videos on teaching techniques, to participating in communities of other users of the product suite, to posting and downloading PD-related materials.

The product, PD 360, is a research-based, online professional development solution widely used in the United States. It offers a large library of expert-produced training videos, powerful support tools and resources, and an online professional learning community of nearly one million educators. Examples of video topics include classroom management, differentiation, minority student achievement strategies, and project-based learning. The videos are crafted by experienced classroom teachers and vetted by PhD-level experts in education to ensure best practices in education. Following each video, professionals answer reflection questions to assess impact and promote engagement. The product also includes public forums to share resources and ideas with other educators. Professionals are encouraged to utilize all aspects of the product. Multiple unpublished case studies have been completed to quantify and validate the effectiveness of the product and approach.

The pre-PD included data from the 2009-2010 school year and post-PD from the 2010-2011 school year. Participation was defined as logged-in use of the PD offering for a minimum average of 90 minutes per teacher cumulatively school-wide per school year, thus ensuring conclusions could be drawn reflecting sufficient PD use and not merely low levels of participation or sign-on alone. In addition, schools were included with their corresponding districts only if fewer than 25% of schools within a given district were categorized as PD participants. All schools categorizable as participating within a district were included only if the school and district each met inclusion criteria.

A dataset was extracted from the data automatically captured by the PD provider (School Improvement Network) as a result of PD use. The final data set included 750 schools within 211 districts in 39 States. Power analysis indicated that a sample of 169 schools (along with their respective districts) would suffice for detecting minimal pre-versus-post changes of 0.5 in mean student performance, as well as for establishing significant differences of 0.5 between participation versus non-participation in mean student performance. A random sample of 169 schools was extracted from the dataset for analysis, which resulted in 73 districts in 19 States. Sample-wise, therefore, all schools included represented PD participants at a minimum mean level of participation per educator, while their respective districts represented quasi-experimental demographic matches of non-participants, matched for ethnic and socio-economic mix.

Student performance data were gathered from publically available web sources for the two consecutive school years. When not available online, performance data were gathered by district-supplied Excel spreadsheets which followed telephone requests, all with Institutional Review Board (IRB) approval where IRB relationships existed. Performance data analyzed were defined as the sum of the percentages of students by school, by year, who was rated either proficient or advanced in math and reading on whatever standardized test was in use for both years within each school. Therefore, performance data were normalized for differences between assessment tools by setting. All analyses were conducted using SPSS version 17.0 or higher (PASW Statistics, SPSS, 2009, with SAS used for confirmatory purposes when results were close to $p<0.05$).

## 3. RESULTS AND DISCUSSION

Student performance levels were contrasted for Year 1 (pre-PD) versus Year 2 (post-PD) (See Table 1, Figures 1 and 2). For math, results showed that students of teachers in schools meeting the PD-inclusion criteria experienced 18.9% (All percent changes reported were calculated as percent change relative to the previous year ({Year 2 – Year 1}/ Year 1)) increases in performance year-over-year ($p<.001$), versus 4.2% increase over the percent from the previous year for their respective districts ($p<.01$). Contrasting the percent increases yielded an effect size of 4.5 (18.9%/4.2%), or that the growth for students of PD participants was 4.5 times greater than for their respective districts. Differences between school and district means in year 1 were marginally significant ($p=0.065$), favoring districts, and reversed for year 2 ($p=0.085$).

Table 1. Performance for participating schools versus their districts

| | | Year 1 | Year 2 | Change | Pct Change | Level of Significance |
|---|---|---|---|---|---|---|
| Math | | | | | | |
| Schools | Mean | 58.4 | 69.5 | 11.1 | 18.9% | p<.001 |
| | StDev | 21.9 | 21.1 | | | |
| Districts | Mean | 62.8 | 65.5 | 2.6 | 4.2% | p<.01 |
| | StDev | 20.4 | 20.2 | | | |
| | Level of Significance | p=0.065 | p=0.085 | | | |
| Reading | | | | | | |
| Schools | Mean | 56.9 | 67.2 | 10.3 | 15.3% | p<.001 |
| | StDev | 22.4 | 22.1 | | | |
| Districts | Mean | 61.2 | 62.7 | 1.6 | 2.5% | p<.01 |
| | StDev | 21.1 | 20.7 | | | |
| | Level of Significance | p=0.079 | p=0.063 | | | |

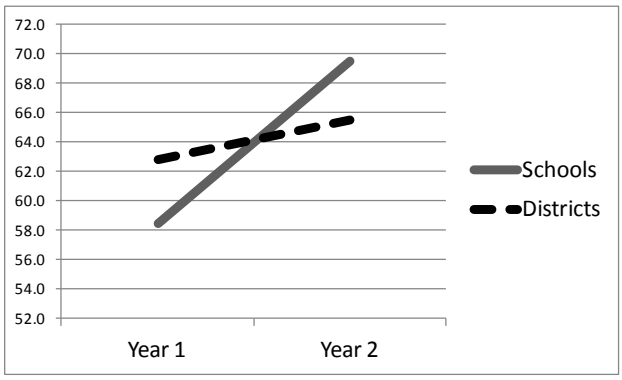


Figure 1. Comparative pre versus post performance for math proficient and advanced.

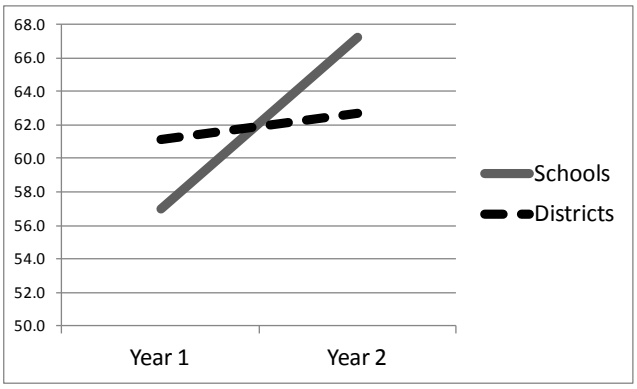


Figure 2. Comparative pre versus post performance for reading proficient and advanced.

For reading performance, results showed that students of teachers in schools meeting the PD-inclusion criteria experienced 15.3% increase in performance year-over-year (p<.001), versus 2.5% for their respective districts (p<.01). Contrasting the percent increases yielded an effect size of 6.1 (15.3%/2.5%), or that the growth for students of PD participants was 6.1 times greater than for their respective districts. As with math performance, difference between school and district means in year 1 were marginally significant (p=0.079), favoring districts, and reversed for year 2 (p=0.063).

## 4. CONCLUSION

The multi-state, quasi-experimental study provided compelling evidence of the comparative impact of on-demand, Internet-based PD for enhancing teacher efficacy. Student performance in schools classified as being PD-participants showed significant year-over-year advantages in student performance versus their respective districts, as well as substantively better end-of-year positioning. Effect sizes of 4.5 and 6.1 for math and reading, respectively, exceeded usual expectations. These gains documented were achieved above those of a contrasting group of matched demographics, which also experienced significant improvements, adding further to the magnitude of the impact observed.

The reported findings were made possible through leveraging a quasi-experimental approach. Future research might include studies involving random assignment of students to teachers matched on some set of PD-relevant criteria. However, such laboratory approaches to educational research will remain challenging to find in the literature, and rare to achieve, given the realities of educational settings. The challenges of lab-like research are all the more difficult in public schools where both teachers and students are assigned together without the matching and randomization such studies would require. Other studies for the future might involve contrasts of on-demand, Internet-based PD versus seminar-style approaches.

Taken as a whole, the findings from this research support the high-participation use of Internet-based, on-demand PD for improving teacher efficacy and improving student performance. Given the cost-effectiveness and efficiency of this PD delivery approach, such methods should be considered as credible strategies for addressing needs for continuously improved teacher efficacy and better student achievement.

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