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The Impact of the New Tech Network Design on Academic Outcomes

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ABSTRACT

The impact of the New Tech Network (NTN) design on several academic measures was tested on ninth graders in four schools in one state located in the Southeastern United States. Research questions explored the extent to which achievement test scores, dual credits earned, and dropout rates differed between ninth grade students in high fidelity NTN schools and similar students in traditional schools. A quasi-experimental design using student-level variables from the state's PowerSchool database was conducted in order to test hypotheses related to the research questions. Results suggest that, when implemented with fidelity to the model, there was a significant effect of NTN on achievement test scores as students in NTN schools scored higher on both the End of Course (EOC) Math and English Language Arts (ELA) tests compared to students in control schools. This effect remained after controlling for poverty, race, and preexisting achievement level. Students in NTN schools also were slightly more likely to earn dual credit compared to similar students in control schools. However, there was no effect of NTN participation on dropout rate as students in NTN schools were more likely to be retained in their current grade level and not moving to the next grade level compared to students in control schools.

Keywords: new tech design, project-based learning, problem-based learning, deeper learning practices

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The New Tech Network Design

The New Tech Network (NTN) design focuses on systemic changes of teaching and culture, and implementation of deeper learning practices that are geographically, politically, and socioeconomically diverse (Adams & Duncan Grand, 2019). As of 2022, there are 81,500 students in 103 school districts learning in NTN schools across the United States. This represents 95 high schools, 42 middle schools, and 35 elementary schools.

NTN schools integrate content across curriculum and focus on the development of students' analytical and critical thinking skills, problem solving skills, and communication and collaboration skills. Schools that have transitioned to NTN strive to enable students to gain the knowledge and skills they need to succeed in life, college, and the careers of tomorrow. Additionally, a one-to-one computer ratio seeks to create a learning network in NTN schools to connect students, teachers, and parents to each other and the NTN national network. A standards-driven, STEM-infused curriculum provides students with rigorous STEM coursework that strives to engage students and make coursework relevant to society.

NTN schools utilize project-based learning (PjBL) as the primary pedagogical approach. NTN teachers are supported by intense coaching and an online learning management system (ECHO) that helps track progress of student academic and non-academic skills. PjBL in an NTN school is a comprehensive approach to school reform that highlights the interplay between culture, instruction, assessment, and adult learning (New Tech Network, 2022). PjBL in an NTN school is designed to be meaningful and equitable because of

the practices embedded in the model, including teachers as warm demanders, asset-based feedback, seeing beyond deficits, and reframing attributes (Hammond, 2015; Paris, 2017).

In addition to being a means to increase equity, the NTN model embraces the idea that PjBL provides students with learning experiences that allow them to develop critical competencies and skills that positively influence outcomes, such as academic achievement and college and career readiness. Furthermore, PjBL is a mechanism for improving equity and addressing issues of disparity in learning and outcomes among students.

Background and Theoretical Framework

The Efficacy of the NTN Design

A small number of past studies have investigated the efficacy of the NTN design and whether or not it is achieving what it set out to achieve for students, teachers, and schools. These studies have analyzed key outcomes of the NTN design, including graduation rates and progression, academic and behavioral outcomes, social-emotional outcomes, equitable outcomes for all students, and school culture.

In one of the earliest studies of the NTN design, Rockman et al. (2006) found that 89% of past NTN students attended a two-year or four-year college/university or a professional/technical institute, and 40% of those alumni were majoring in STEM fields or working in STEM professions. Several years later, the Center of Excellence in Leadership of Learning (2011) conducted a study and found that NTN students in Indiana had higher attendance rates and fewer disciplinary incidences than similar non-NTN students. Then in 2014, a mixed-methods study conducted by the American Institutes for Research analyzed the aggregate outcomes of ten schools implementing deeper learning practices, one of which was an NTN school. The study concluded that, compared to similar students in non-deeper learning schools, treatment students scored higher on all three reading, mathematics, and science PISA assessments; scored higher on the state English Language Arts (ELA) and mathematics tests; reported higher levels of interpersonal and intrapersonal competencies, such as collaboration, academic engagement, motivation to learn, and self-efficacy; and were more likely to graduate from high school on time, enroll in four-year postsecondary institutions, and enroll in selective institutions (Zeiser et al., 2014). Additionally, and specific to NTN students, academic achievement and college and career readiness outcomes were analyzed as a part of a federal Investment in Innovation project evaluation between 2015 and 2017. The study concluded, in its last year with the largest number of students included, that NTN 9th graders outperformed control students on End of Course Math (EOC) and ELA assessments and that, while

there were null findings on some outcomes, NTN 11th graders outperformed control students on ACT composite scores and workforce skills outcomes measured by ACT WorkKeys (Culclasure et al., 2017). A more recent study analyzed social-emotional and non-academic outcomes at schools in several states and yielded favorable findings for students at NTN schools (Hinnant-Crawford & Virtue, 2019).

Several other studies conducted internally at NTN have yielded positive findings on these academic outcomes for students in NTN schools. An internal study done in rural North Carolina found that high schools that utilized the NTN model had significantly higher average graduation rates as compared to comparison schools (Dobyns et al., 2012). This study also found that NTN students had higher attendance rates and composite SAT scores than similar students in comparison high schools. Another internal study found that NTN students in low-income schools had higher graduation and enrollment rates than the national average for similar schools (Bergeron, 2017). More recent work by Bergeron (2020) also highlighted the efficacy of the NTN model in terms of implementing deeper learning practices as an inclusive approach for college and career preparation.

PjBL as Primary Pedagogical Approach

As stated above, the NTN model uses PjBL as its primary pedagogical approach. Various quantitative studies have investigated the ways in which PjBL influences these academic outcomes for students, teachers, and schools. Early on in PjBL scholarship, Mergendoller, Maxwell, and Bellisimo (2006) compared the effectiveness of PjBL and traditional instructional approaches in developing high school students' economics knowledge in the context of verbal ability, interest in economics, preference for group work, and problem-solving efficacy. Results showed that PjBL increased students' economic competencies compared to traditional methods, and that students with low to midrange verbal abilities learned more in PjBL classes than they did in lecture or discussion classes. Another study around the same time examined the impact of PjBL on the ability of high achieving high schoolers in Israel to design and implement solutions for technology-based problems. Pre- and post-tests showed a faster rate of improvement in technological knowledge for students engaged in PjBL compared to those in traditional classes (Mioduser & Betzer, 2007). Other results from this study showed positive changes in attitude toward technology and higher levels of performance in design skills among PjBL students. Another study found benefits of PjBL in urban public school STEM instruction. Geier et al. (2008) followed approximately 5,000 students in two cohorts of seventh and eighth graders in the Detroit Public Schools. PjBL students showed significantly higher pass rates on the state

standardized science test as well as increases in their science content understanding and process skills compared to control group peers. These gains remained up to a year and a half after students' participation in PjBL. Higher levels of participation in the project-based curriculum were also associated with higher achievement scores. Additionally, Kanter and Konstantopoulos (2010) found that PjBL science curriculum improved science achievement among minority students, although it did not improve their personal attitudes and future interests in science. Summers and Dickinson (2012) conducted a subsequent study to compare the social studies and college and career readiness success rates of high school students in a PjBL high school and a traditional high school. This four-year longitudinal study found that PjBl students scored higher on social studies standardized tests and had higher levels of promotion to the next grade level than did traditional students. Research also has indicated PjBL as a viable way to help ESL students gain proficient English abilities while building knowledge and language skills in the content areas (Eslami & Garver, 2013). Other studies have also pointed to the benefits of PjBL on students with disabilities (Parsi, 2017).

PjBL is also thought to develop students' cognitive and affective skills while being a way to equalize student outcomes. Alacapinar (2008) used qualitative and quantitative analysis, including a video-recorded semi-structured interview, to study PjBL students in comparison to a control group of students. Results indicated that PjBL students had a higher cognitive domain and reported that PjBL enriched their creativity while enhancing their ability to collaborate in trusting relationships with peers. In more recent years, scholars investigated the relationship between the implementation of PjBL and academic and social-emotional outcomes in three schools in one Southeastern state. Findings did not reveal consistent differences in academic outcomes as measured by student test scores; however, PjBL students did perform better on inventories of social-emotional skills (Culclasure et al., 2019).

There is a recent focus on how PjBL can serve as a powerful tool for increasing equitable outcomes for children. Research conducted by the Lucas Education Research (2021) highlighted the persistent disparities in opportunities to learn and exposure to learning approaches such as PjBL. It, furthermore, presented findings of four peer-reviewed studies that showed that using rigorous project-based learning in schools had strong and positive effects on student outcomes across grades and subjects (Deutscher et al., 2021; Duke et al., 2020; Krajcik et al., 2021; Saavedra et al., 2021).

Much of the literature on learning in NTN schools and PjBL points to positive results for teachers, students, and schools, and opportunities to serve as a lever for increasing equitable outcomes for students. This study seeks to build upon the literature pointing in this direction and further test, in a rigorous manner, academic and behavioral outcomes associated with participation in a high-fidelity NTN school.

Method

Fidelity to the model

Because it is critical to establish implementation fidelity when analyzing outcomes of an intervention or model, the first part of this study examined key constructs of NTN implementation in the four schools included in the study. Key constructs of interest were: teacher preparation and support; technology infrastructure, and student opportunities to learn. Additionally, there were three levels at which fidelity of implementation was examined: classroom/teacher Level; school level; and program level. Fidelity data were collected through document analysis and surveys and confirmed with evidence provided by participating schools/districts and evaluator observations during site visits. Results, which found that all four schools were implementing the NTN model at a threshold of fidelity high enough to examine outcomes, are found in Table 1 below. Appendix A includes more detail on the methodology and confirmation of these key elements of the NTN model.

Sample Results: Characteristics and Baseline Equivalence Testing

Preexisting achievement levels (as measured by the SC Ready assessment), race (proportion of minority students), gender (proportion of female students), and poverty (proportion of students who qualify for free and reduced lunch) were used as covariates in the present research. These covariates have been identified as both relevant and important to research on the educational outcomes that are the focus of the present research (e.g., Wong et al., 2016). As Table 2 suggests, the combined control sample was well matched with the combined treatment sample on these demographic characteristics, aside from race.

Note that the covariate SC Ready score is a composite score created by averaging scores on the SC Ready ELA, SOC, SCI, and W scores $[(SC\_ELA+SC\_SOC+SC\_SCI+SC\_W)/4]$. Details about the SC Ready assessments, including psychometric properties and sample items, can be found at https://ed.sc.gov/tests/middle/sc-ready/. The SC Ready score was used as a covariate to control for preexisting achievement levels in the analyses reported below. The only measure that indicated a difference between treatment and control groups was race (proportion minority). Students were categorized on this race variable by the state of South Carolina as part of

School A

Key Component	Data Source	Classroom Indicator	School Indicator	Program Indicator
Summer Professional Development	Observation/ Attendance Log	N/A	Met	Met
Teacher/Admin Residency Training	Interviews/ Attendance Log	N/A	Met	Met
Coaching	NTN Coach Schedule/ Agendas	N/A	Met	Met
1:1 Computer Access	Observation/PO	Met	Met	Met
ECHO	Online Observation	Met	Met	Met
Internships	Program Records	N/A	Met	Met
College Level Learning	Program Records	N/A	Met	Met
College Going Assistance	Program Record	N/A	Met	Met
STEM PJBL	ECHO/Lesson Plans/Observations	Met	Met	Met

School B

Key Component	Data Source	Classroom Indicator	School Indicator	Program Indicator
Summer Professional Development	Observation/ Attendance Log	N/A	Met	Met
Teacher/Admin Residency Training	Interviews/ Attendance Log	N/A	Met	Met
Coaching	NTN Coach Schedule/ Agendas	N/A	Met	Met
1:1 Computer Access	Observation/PO	Met	Met	Met
ECHO	Online Observation	Met	Met	Met
Internships	Program Records	N/A	Met	Met
College Level Learning	Program Records	N/A	Met	Met
College Going Assistance	Program Record	N/A	Met	Met
STEM PJBL	ECHO/Lesson Plans/Observations	Met	Met	Met

Table 1. Results from the Fidelity Analysis

School C

Summer Professional Development	Observation/ Attendance Log	N/A	Met	Met
Teacher/Admin Residency Training	Interviews/ Attendance Log	N/A	Met	Met
Coaching	NTN Coach Schedule/ Agendas	N/A	Met	Met
1:1 Computer Access	Observation/PO	Met	Met	Met
ECHO	Online Observation	Met	Met	Met
Internships	Program Records	N/A	N/A	N/A
College Level Learning	Program Records	N/A	Met	Met
College Going Assistance	Program Record	N/A	Met	Met
STEM PJBL	ECHO/Lesson Plans/Observations	Met	Met	Met

School D

Summer Professional Development	Observation/ Attendance Log	N/A	Met	Met
Teacher/Admin Residency Training	Interviews/ Attendance Log	N/A	Met	Met
Coaching	NTN Coach Schedule/ Agendas	N/A	Met	Met
1:1 Computer Access	Observation/PO	Met	Met	Met
ECHO	Online Observation	Met	Met	Met
Internships	Program Records	N/A	N/A	N/A
College Level Learning	Program Records	N/A	Met	Met
College Going Assistance	Program Record	N/A	Met	Met
STEM PJBL	ECHO/Lesson Plans/Observations	Met	Met	Met

Table 1 continued. Results from the Fidelity Analysis

Full Sample	Control Groups (Four Schools Combined)	Treatment Groups (Four Schools Combined)	Results
SC Ready Index [(ELA+SOC+SCI+W)/4]	$N = 908$ $M = 503.05$ ($SD = 23.24$)	$N = 1170$ $M = 504.70$ ($SD = 23.55$)	$t (2076) = -1.58$, $p = .11$
Race (proportion Minority)	$539/1201 = .45$	$884/1627 = .55$	$\chi^2 (1, 2828) = 24.70$, $p < .001$
Gender (proportion Female)	$552/1201 = .46$	$732/1628 = .45$	$\chi^2 (1, 2831) = .61$, $p = .44$
Poverty (proportion in poverty)	$853/1203 = .71$	$1145/1622 = .71$	$\chi^2 (1, 2825) = .03$, $p = .86$

Note: There is a statistically significant difference Race (proportion Minority), such that there is a larger proportion of minority students in the treatment group.

Table 2. Demographics of Sample

the school enrollment process. Although classifying people into races using this approach makes analyses easier for the purpose of research, it likely does not conform to more recent thinking about the issue of race according to QuantCrit (e.g., Gillborn et al., 2018).

This race variable was subjected to a chi square analysis, which suggested a statistically significant difference in the sample between the treatment (proportion minority = .55) and control groups (.45), such that the treatment samples had a higher rate of minorities, χ2(1, N = 2828) = 24.70, p < .001. Note, however, that because the variables noted above were statistically controlled in the analyses presented here, this difference in the proportion of minority students posed no problem for interpreting the outcome of this evaluation analysis. No other baseline equivalence measures indicated statistically significant differences between treatment and control groups.

Results

Variables in the Analyses

In order to better understand the results reported below, it is important to describe the remaining measures that were involved in the analyses, as well as the statistical approaches that were employed. This information is listed in Table 3. Note that these specific variables were chosen for this project because (a) they were available in the data sets provided by the state of South Carolina and (b) past research suggests

that EOC scores, dropout, retention, and dual credits earned are important indicators of academic achievement (e.g., Shavelson et al., 1991).

Approach to Analysis

In this study, we analyzed the continuous outcome measures (i.e., EOC scores) using analysis of covariance (ANCOVA), which allows for covariates to be included in an ANOVA model. ANCOVA reports the results in terms of adjusted group means, standard error, and an F-value, which is convenient to graph and display to those who may not be familiar with statistics. We used a similar analysis approach called binary logistic regression for the dichotomous variables (dropout, retention, and dual credit), which presents the proportion of participants in one category or the other on an outcome measure (e.g., the proportion of students dropping out of treatment vs. control schools), and reports the results as an odds ratio (i.e., the likelihood that being in a particular category increases or decreases an outcome) with a corresponding significance level for the effect. This analysis includes all predictor variables in a model, and assesses the unique effect of each predictor alone on the outcome while statistically controlling all other predictors in the model.

Results on Outcomes of Interest

An ANCOVA was conducted using EOC math scores as the dependent variable, and the New Tech treatment, race, poverty, and SC Ready index score as covariates. The results suggest that participants in the treatment group scored significantly higher on this test (N = 692, Adjusted M = 76.73,

Variable	Type	Scale	Analysis	Notes
SC Ready Index	Covariate	Continuous	ANCOVA and Binary Logistic Regression	Calculated as: (ELA+SOC+SCI +W)/4
Race	Covariate	Dichotomous	ANCOVA and Binary Logistic Regression	0 = non-minority; 1 = minority
Poverty	Covariate	Dichotomous	ANCOVA and Binary Logistic Regression	0 = non-poverty; 1 = poverty
Control Treatment	IV	Dichotomous	ANCOVA and Binary Logistic Regression	0 = control; 1 = treatment
EOC Math	Outcome	Continuous	ANCOVA	For 9th grade sample only
EOC ELA	Outcome	Continuous	ANCOVA	For 9th grade sample only
Dropout	Outcome	Dichotomous	Binary Logistic Regression	0 = no; 1 = yes
Retention	Outcome	Dichotomous	Binary Logistic Regression	0 = no; 1 = yes
Dual Credit Earned	Outcome	Dichotomous	Binary Logistic Regression	0 = none; 1 = at least one dual credit earned

Table 3. Variables

SE = 0.32) compared to participants in the control group (N = 386, Adjusted M = 75.02, SE = 0.43), $F_{(1, 1073)}$ = 10.43, $p < .001$, Cohen's d = 1.34. This would be considered a large effect size, according to Cohen (1992). This effect size exceeds the threshold of 0.4 which, according to Hattie's (2009) Visible Learning model, indicates that this outcome is in the zone of desired effects.

ANCOVA was conducted using EOC ELA scores as the dependent variable, and the New Tech treatment, race, poverty, and SC Ready index as covariates. The results suggest that participants in the treatment group scored significantly higher on this test (N = 794, Adjusted M = 76.21, SE = .27) compared to participants in the control group (N = 595, Adjusted M = 74.21, SE = .31), $F_{(1, 1384)}$ = 11.12, $p < .001$, Cohen's d = 1.86. This would be considered a large effect size, according to Cohen (1992). This effect size exceeds the

threshold of .4 which, according to Hattie's (2009) Visible Learning model, indicates that this outcome is in the zone of desired effects.

A binary logistic regression with dropout as the dependent variable and the New Tech treatment, race, poverty, and SC Ready index score as covariates was conducted. It is important to note that due to the small number of participants who dropped out of either condition (3% of the total sample), results of this analysis should be interpreted with caution. A test of the full model (i.e., New Tech treatment, race, poverty and SC Ready index as predictors of dropout) against a constant only model was not statistically significant, $\chi^2 (4, N = 2077)$ = 8.35, $p = .08$. The model explained 7% of the variance in dropout rates, Nagelkerke R^2 = .07, and correctly identified 99.6% of cases. No variable in the model independently predicted dropout. The effect of the NTN model on dropout is negligible.

A binary logistic regression with retention as the dependent variable and the New Tech treatment, race, poverty, and SC Ready index score as covariates was conducted. A test of the full model (i.e., New Tech treatment, race, poverty and SC Ready index as predictors of not moving on to the next grade level) against a constant only model was statistically significant, χ^2 (4, N = 2077) = 302.91, $p < .001$. The model explained 22% of the variance in dropout rates, Nagelkerke $R^2 = .22$, and correctly identified 80% of cases. Participants in the treatment group were 1.33 times more likely to be retained in their current grade level and not moving on to the next grade level compared to participants in the control group, Exp(B) = 1.33, $p = .02$. According to Chen, Cohen, and Chen (2010), this effect size is equivalent to a small Cohen's d (.2 or less). This effect size does not exceed the

threshold of .4 which, according to Hattie's (2009) Visible Learning model, indicates that this outcome is in the zone of developmental effects. The results also suggest that participants in poverty were 2.86 times more likely to be retained compared to participants not in poverty, Exp(B) = 2.86, $p < .001$. Using Chen et al.'s (2010) categories, this effect size falls between a small and medium Cohen's d (between .2 and .5). Lastly, the results suggest that an increase in scores on the SC Ready test by one point slightly decreased the likelihood of being retained, B = -.04, Exp(B) = .96, $p < .001$. This effect size is equivalent to a small Cohen's d (.2 or less). No other variable in the model predicted being retained.

A binary logistic regression with dual credit as the dependent variable and the New Tech treatment, race, poverty, and SC Ready index score as covariates was conducted. It is

Full Sample 9th graders			
Full Sample	**Control Groups**	**Treatment Groups**	**Results**
EOC Math	N = 386 Adjusted M = 75.02 SE = .43	N = 692 Adjusted M = 76.73 SE = .32	F (1, 1073) = 10.43, p < .001, Cohen's d = 1.34
EOC ELA	N = 595 Adjusted M = 74.83 SE = .31	N = 794 Adjusted M = 76.21 SE = .27	F (1, 1384) = 11.12, p < .001, Cohen's d = 1.86
Dropout (proportion)			N in the analysis = 2077 Treatment was not a predictor of dropout
Retention (proportion)			N in the analysis = 2077 Treatment predictor: Exp(B) = 1.33, p = .02, small effect size
Dual Credit (proportion)			N in the analysis = 2077 Treatment predictor: B = -2.16, Exp(B) = .12, p < .001, small effect size

Note: Inferential results are calculated based on cases with the outcome and all covariates available.
Aside from dropout, all outcomes were significantly different between control and treatment conditions or treatment as a predictor at p = .05 or less.

Table 4. Results on Outcomes of Interest

important to note that, due to the small number of participants who dropped out of either condition (2% of the total sample), results of this analysis should be interpreted with caution. A test of the full model (i.e., New Tech treatment, race, poverty and SC Ready index as predictors of attaining at least one dual credit) against a constant only model was statistically significant, $\chi2$ (4, N = 2077) = 72.89, p < .001. The model explained 19% of the variance in attaining dual credit, Nagelkerke $R2$ = .19, and correctly identified 98% of cases. Participants in the treatment group were 0.12 times more likely to not earn dual credit (i.e., they were slightly more likely than participants in the control group to earn dual credit), B = -2.16, Exp(B) = .12, p < .001. Using Chen et al.'s (2010) categories, this effect size is equivalent to a small Cohen's d (less than .2). This effect size does not exceed the threshold of .4 which, according to Hattie's (2009) Visible Learning model, indicates that this outcome is in the zone of developmental effects. Also, minority students were 3.30 times more likely to earn dual credit compared to non-minority students, Exp(B) = 3.30, p < .001. This effect size is equivalent to a medium Cohen's d (approximately .5). Lastly, the results suggest that an increase in SC Ready scores by one point slightly increases the likelihood of earning dual credit, Exp(B) = 1.04, p < .001. This effect size is equivalent to a small Cohen's d (.2 or less). No other variable in the model predicted earning dual credit.

Discussion and Conclusion

There are very few studies on NTN design efficacy, considering the number of students in NTN schools and the popularity of project-based learning, independent of NTN, in the classroom. Because of this, there is a need for more measurements of NTN design model efficacy in order to establish a solid research base. It is the hope that this study augments the current research base on not only NTN, but also PjBL as a mechanism for positively impacting academic and behavioral outcomes and increasing equity in outcomes.

Results of the analysis presented in this article suggest that there is a significant main effect of NTN on EOC scores, such that students in the New Tech schools scored higher on both the EOC Math and EOC ELA tests compared to students in the control schools. This effect remained after controlling for poverty, race, and preexisting achievement level (8th grade SC Ready scores). Students in the New Tech schools were also slightly more likely to earn dual credit compared to students in the control schools. However, there was no effect of the NTN treatment on dropout rate, and students in the New Tech schools were 1.33 times more likely to be retained in their current grade level compared to students in the control schools.

The results of this study suggest that the NTN program, which uses PjBL as its primary pedagogical approach, increased academic achievement. According to the effect size categories developed by Cohen (1992), the size of these effects are large. This research also provides evidence for the argument that PjBL may help equalize opportunities and outcomes for disadvantaged students, especially in areas where they have previously been underrepresented.

Overall, the results are quite promising. The New Tech program at these schools had only been in place for the 9th grade treatment students for less than one school year prior to the outcome measures being administered, and yet there was a very strong, positive effect of the treatment on EOC scores. There was also a small but marginally significant positive effect of the NTN program on earning dual credit. The retention outcome, however, necessitates further exploration.

Although rigorous, this study does have limitations that must be considered. The biggest limitation of this study is that it is not a randomized controlled trial (RCT), which is desired for research studies of model efficacy, as it was impossible to randomly assign students to the NTN treatment. Thus, the research team used what it thought was the second-best method, a quasi-experimental design that matches treatment and comparison samples in order to ensure baseline equivalence. Even though the design did not utilize an RCT design, the research team calculated baseline equivalence before the study commenced to help ensure apples-to-apples comparisons. Another limitation of this study is that, because of feasibility, it is not longitudinal and only looks at one year of data. However, the hope is that a similar methodology can be used to do multi-year analyses of NTN impact in the future. Regardless of the limitations, the methodology and findings of the study augment the existing research base on both the NTN design and the use of PjBL in schools and should lead to additional studies on model fidelity and the efficacy of these practices.

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Appendix A: NTN Fidelity Assessment

The fidelity study examined key components of NTN implementation in the four schools included in the study. There were three levels of fidelity examined: classroom/teacher level; school level; and program level. Fidelity data were collected through various sources and confirmed with evidence from the participating schools/districts, New Tech, or site visits. The fidelity study included an examination and confirmation by researchers of the following key elements of the New Tech model.

- **Construct 1: Teacher/Provider Preparation and Support**
  - NTN Summer Professional Development
    - Attendance at Grand Rapids (Year 1)
    - Attendance at New Orleans (Year 2) and Expansion Schools (Year 1)
    - Attendance at Chicago (Year 3) and Expansion Schools (Year 2)
  - Residency Training
    - 1 Week Immersion for Select Teachers/Administrators
  - NTN Coaching

- **Construct 2: Technology Infrastructure**
  - 1:1 Access to computers
  - Access and use of ECHO

- **Construct 3: Student Opportunities to Learn**
  - Internships
  - Exposure to College Level Learning
    - Dual Credit/AP
  - College Going Assistance
    - FAFSA
    - College Applications
  - Engagement in STEM Related PJBL's
    - STEM related classes