

# Evaluation of the Charlotte-Mecklenburg Schools Personalized Learning Initiative

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## Personalized Learning Background

Starting in the Fall Semester of the 2014-2015 school year, Charlotte-Mecklenburg Schools (CMS) implemented Cohort 1 of the Personalized Learning Initiative in 15 schools across the district, including 10 elementary schools, 4 middle schools, and 1 high school. The Personalized Learning initiative was implemented in various course subjects, including but not limited to math, reading, science, language arts, Physical Education, Health, and Web Design. While there is no standardized definition as to what constitutes personalized learning (PL) in a classroom, an observer of a PL classroom would expect to see the following:

1. Tailored instruction to meet individual students' needs, skills, and interests.
2. Experiences that expose students to future college and career choices.
3. Teachers facilitating the classroom in a way that encourages students to take ownership of their own learning goals through instruction, guidance, and support.

Additionally, five teaching and learning strategies have been identified as the most common in schools implementing personalized learning:

1. **Whole Child** — Building positive relationships and creating a learning environment that enables personalized learning, student collaboration, and promotes creativity.
2. **Ownership** — Teachers work along with students to create unique personalized goals, using data from multiple sources to guide the process and establish a voice in what they are doing and why.
3. **Mastery Progression** — Student mastery is assessed when the student is ready, allowing students to progress at their own pace and value feedback to achieve academic standards and pursue personal growth.
4. **Instructional Shift** — Tailored learning content, which allows students to be flexible in their content, pace and direction of their learning.
5. **Emphasis on College and Career Readiness** — Curriculum that develops a student's skills beyond academic content.<sup>1</sup>

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<sup>1</sup>Pane, John F., Elizabeth D. Steiner, Matthew D. Baird and Laura S. Hamilton. Continued Progress: Promising Evidence on Personalized Learning. Santa Monica, CA: RAND Corporation, 2015. [http://www.rand.org/pubs/research\\_reports/RR1365.html](http://www.rand.org/pubs/research_reports/RR1365.html).

During the 2015-2016 school year (Cohort 2), 18 more schools in the district were added, and beginning in the 2016-2017 school year (Cohort 3), 13 more schools will be added, for a total of 46 schools across CMS participating in the Personalized Learning Initiative. CMS has set a goal that by 2018 all students will have access to personalized learning, as outlined in the “Strategic Plan 2018: For a Better Tomorrow”.<sup>2</sup>

**Table 1: Number of Personalized Learning Schools by Type and Cohort Year**

School Type	Cohort Year	Number of Schools
Elementary	2014-2015	10
Elementary	2015-2016	11
Elementary	2016-2017	8
Middle School	2014-2015	4
Middle School	2015-2016	4
Middle School	2016-2017	2
K-8	2015-2016	2
High School	2014-2015	1
High School	2015-2016	2
High School	2016-2017	2

## Evaluation Questions

The program evaluation for the Personalized Learning Initiative focuses on two research questions:

1. Is there an association between personalized learning and student math outcomes?
2. To what extent do the students who participate in personalized learning report engagement?

A third research question, “Is there an association between personalized learning and behavior?” has been omitted due to the limited availability of data. Since PL is meant to engage students in their classrooms, it would be important to know exactly where behavior incidents occurred (such as, in the classroom, hallway, cafeteria, the playground, etc.) because the PL team theorized that behavioral incidents *in the PL classroom* may decrease, while behavioral incidents in other school locations may remain unchanged. However, the specific location of where the incident occurred cannot be determined on a consistent basis with the data available. The omission of the specific location makes it difficult to determine whether Personalized Learning, in particular, has an impact on behavior, as it is not known if the incident took place while receiving personalized learning instruction or while in a personalized learning

<sup>2</sup>Charlotte Mecklenburg Schools. Strategic Plan 2018: For a Better Tomorrow. Charlotte, NC:<http://www.cms.k12.nc.us/mediaroom/Documents/StrategicPlan2018%20rev%20063016.pdf>.

setting versus, for example, while transitioning from lunch to the classroom. In short, at this time, we are not able to determine whether students display better behavior in the PL classroom versus other environments, which is important because that would enable us to determine whether PL is effective at changing student behavior.

For this evaluation, student math end of year results and engagement survey results from Cohort 1 were collected and analyzed, establishing a baseline year for data analysis. Additional data, such as an increased number of participating schools, class subjects, and continuum scale scores for teachers are available beginning with Cohort 2 and should be considered for future research.

## Evaluation Question 1: Personalized Learning and Student Math Outcomes

### Method

#### Sample

Data for the treatment group and control group were collected based on the following criteria:

**Treatment Group.** Teachers who received personalized learning (PL) training prior to or during the 2014-2015 school year were identified. Students who were enrolled in a math class with an identified personalized learning teacher were then classified as part of the treatment group (N=1,367).

**Control Group.** All students who attended a school with an identified PL teacher, but who did not participate in PL during the 2014-2015 school year were classified as part of the control group (N=9,870).

The sample in each group was then restricted by whether each student had a Normal Curve Equivalent growth score in both 2013-2014 and 2014-2015 in math. The Normal Curve Equivalent (NCE) is a way of measuring where a student falls along the normal curve. The numbers on the NCE line run from 0 to 100, similar to percentile ranks, which indicate an individual student's rank, or how many students had a lower score. The NCE score in math are calculated based upon the CMS End of Grade (EOG) assessment in math, and the growth score is the difference in NCEs between two consecutive years. The math EOG is given to students in grades 3-8, and in order to have a growth score for both the 2013-2014 and the 2014-2015 school years, a student must have taken the test in CMS in 2012-2013, 2013-2014, and 2014-2015. As a result, this restricted the sample to students in grades 5-8, and resulted in a sample size of  $n=562$  for the treatment group and  $n=2,970$  for the control group.

Finally, students who were classified as Limited English Proficient (LEP), academically or Intellectually Gifted (AIG), or Students with Disabilities (SWD) were removed from the sample. Despite each of these sub-populations being known to influence academic performance, there

were too few individuals from any one of these sub-populations to compare across treatment and control groups. This is because as the number of levels of comparison increases, the number of individuals that fit within each level diminishes. For example, there were a total of 25 LEP students in the PL group, but when this was further broken out by grade, the number diminished to six in 5<sup>th</sup> grade, seven in 6<sup>th</sup> grade, two in 7<sup>th</sup> grade, and ten in 8<sup>th</sup> grade. When the number of individuals in a group is particularly small, a meaningful group average cannot be calculated, thus the analysis cannot be properly conducted. For this reason, individuals classified as LEP, SWD, or AIG were dropped from the sample. This resulted in a final sample size of  $n=305$  for the treatment group and  $n=1,730$  for the control group. The final sample of students in this evaluation represents a very stable group of students who participate in a general education program. Therefore, generalizing to the broader CMS population is not recommended.

## **Metric**

The NCE growth score was chosen for this analysis because it is standardized across grade and student, and it represents the change in student performance from one year to the next. Prior to the change in the federal education legislation in 2016 regarding No Child Left Behind, NCE growth scores were one of the components used to evaluate teacher effectiveness. The NCE growth scores represent the difference between two consecutive NCE scale scores. If a student received an NCE score of 49 in 2014 and then a score of 52 in 2015, the student would receive an NCE growth score of 3 in 2015. The NCE scale scores are standardized representations of students' EOG and EOC scores. They are similar to percentile scores, where the NCE mean is 50, with 49 percent of students performing below and 50 percent of students performing above. Unlike percentile scores, however, the distance between an NCE score of 49 and 50 is the same as the distance between an NCE score of 89 and 90. This makes comparisons of growth magnitude meaningful between students in different performance brackets. An NCE growth score of 0 means that the student had enough growth to maintain the same relative position within the student's cohort from one year to the next. Growth scores could technically range from -100 to +100; all scores in this sample were between -50 and +50 in 2013 and 2014. More than 60% of students have an NCE growth score between -10 and +10, with group averages ranging from -5 to +5.

## **Statistical Modeling**

An Analysis of Covariance (ANCOVA) was conducted, which is a slightly different version of the more traditional Analysis of Variance (ANOVA). ANOVA compares the numerical mean scores between multiple groups, such as race, in order to determine whether one or more of the groups differs on its average score from any other group's scores. ANCOVA makes the same determination, but it also allows one to control for other variables, meaning to account for other factors that may influence the outcome. In this analysis, past NCE performance from the 2013-2014 school year was used as a control variable, meaning that it was held constant, making it possible to determine if any association between PL and student math achievement existed.

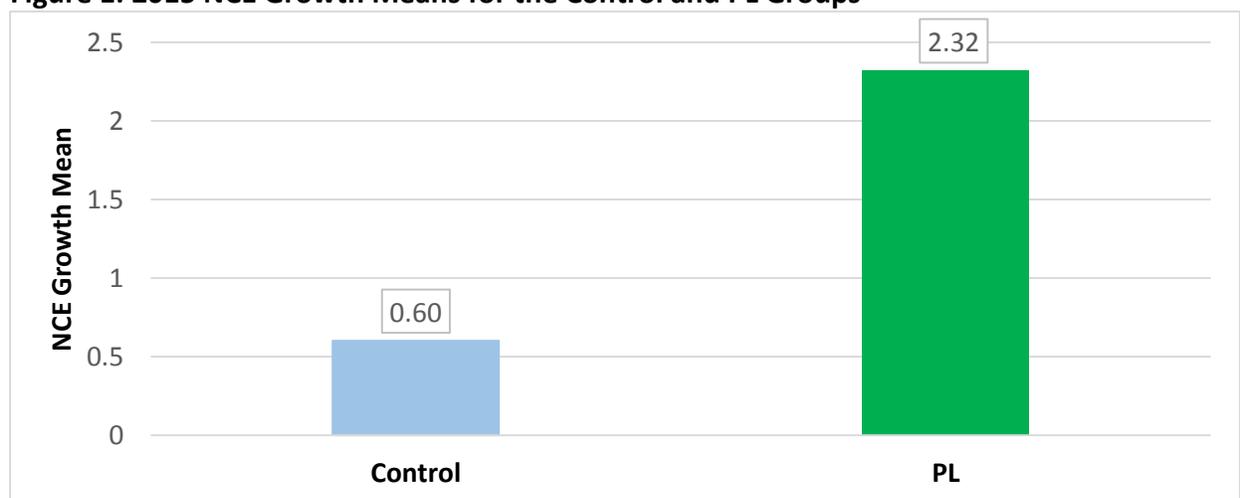
To answer the question, “Did students who took a PL math course show more growth on the NCE than students who did not?”, multiple ANCOVA models were tested. A “full” model was tested initially, which included the PL grouping variable (treatment vs. control group) as well as all of the variables that were theorized to influence either negative or positive growth on the NCE, which included teacher, school, course, grade level, race/ethnicity, gender, and the previous year’s NCE growth score. Variables that were statistically significant (that is, those with a  $p$  value equal to or less than 0.05) were retained, while variables that did not meet this criterion were dropped. The final model includes Group (PL vs. Control), Grade Level, Race/Ethnicity, School, and Course Title as independent variables, NCE growth in 2014 as a control variable, and NCE growth in 2015 as the dependent variable.

All analyses were performed in SAS 9.4.

## Results

Students who had a math course with a PL-trained teacher showed, on average, significantly more growth ( $M = 2.32$ ) than students that did not have a math course with a PL trained teacher ( $M = 0.60$ ). This means that the average growth for students in a PL class was two and a third NCE points higher than the previous year’s EOG percentile ranking, whereas the control group gained only six-tenths of one NCE point (see Figure 1). This effect was significant even after accounting for the school and the math course taken (see Table 2). The overall model was significant ( $R^2 = .24$ ,  $F = 29.94$ ,  $p < 0.001$ ). The  $R^2$  value of .24 indicates that this model accounted for 24% of the variance in average growth, which is a large effect. When all of the variables from the final model were included, school, course, and PL/control were significant. This means that even examining the effects that different schools and courses had on NCE growth scores, there was still a significant portion of variability that was explained by PL/control (see Figures 2 and 3 for average NCE growth by school and by math course).

**Figure 1: 2015 NCE Growth Means for the Control and PL Groups**

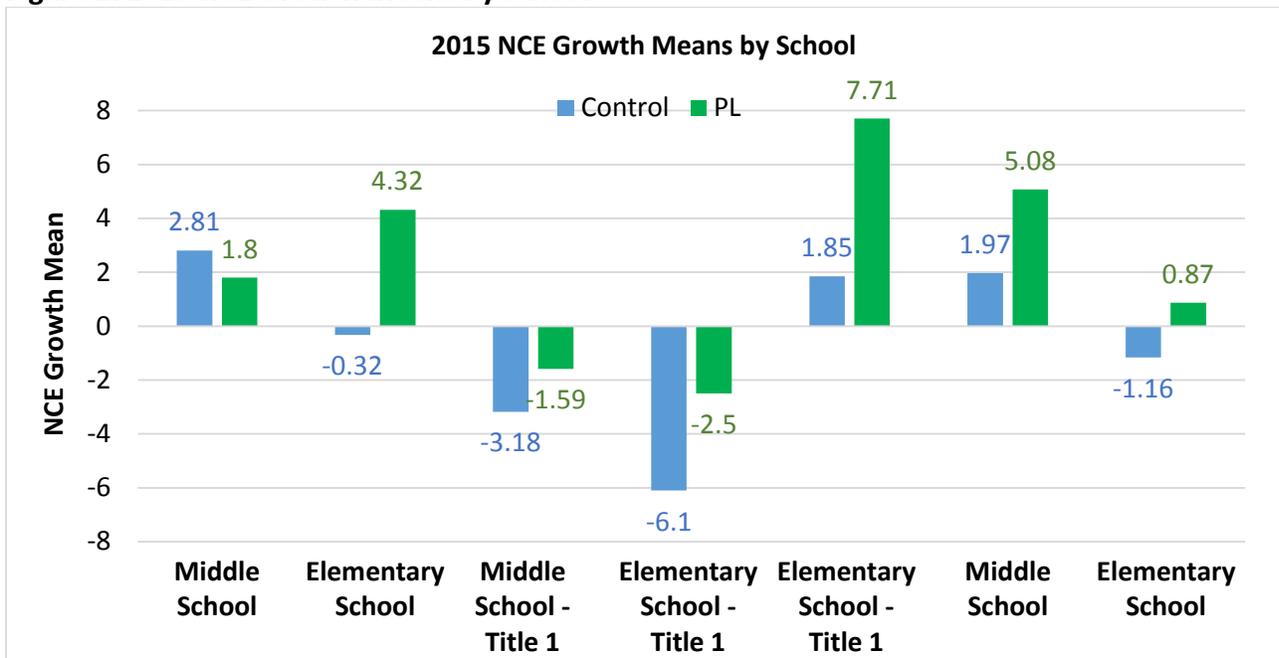


**Table 2: ANCOVA Results**

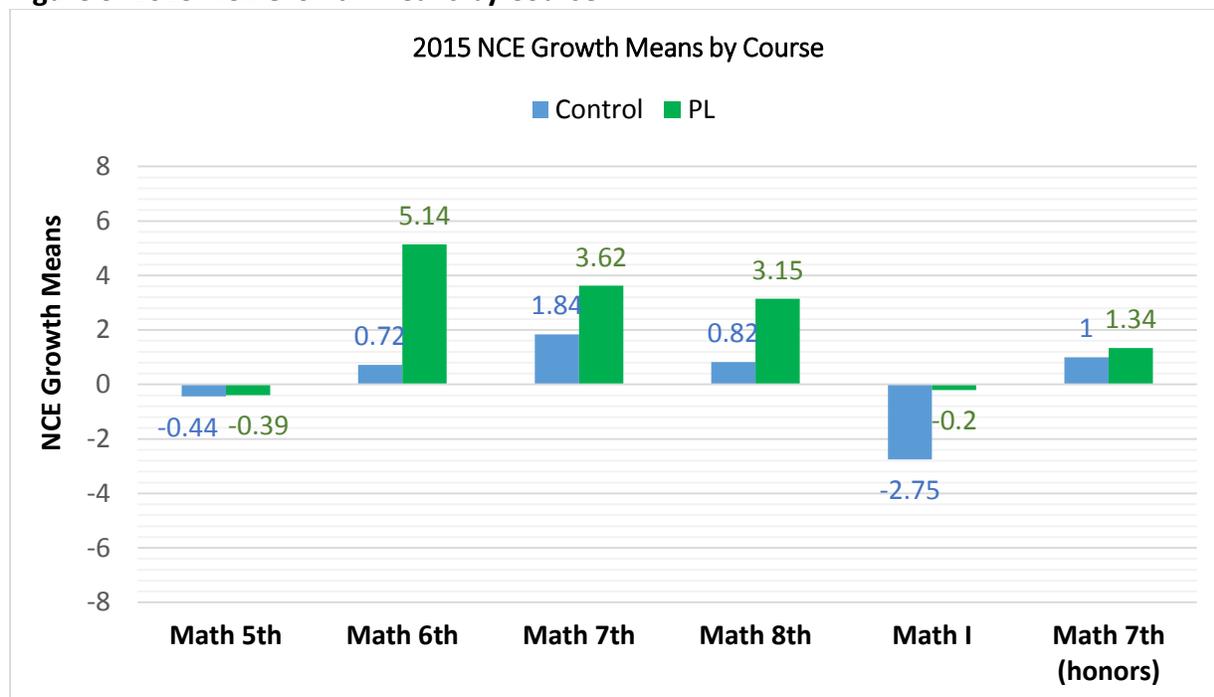
Source	DF	SS	MS	F Value	P Value
Model	21	62169.16	2960.44	29.94	< 0.0001
Error	2013	199036.5	98.88		
Total	2034	261205.7			

Source	DF	Type III SS	MS	F Value	P Value
<b>Growth</b>					
2014	1	44790.94	44790.94	453.00	< 0.01
Control	1	839.96	839.96	8.50	< 0.01
Course	7	1861.85	265.98	2.69	< 0.01
School ID	11	19890.54	1808.23	18.29	< 0.01

**Figure 2. 2015 NCE Growth Means by School**



**Figure 3. 2015 NCE Growth Means by Course**



*Note: In each math course, the PL group had more growth in comparison to the control group.*

## Evaluation Question 2: Personalized Learning and Student Engagement

### Method

In the Fall of 2015, CMS Students in Grades 5-12 were provided the opportunity to complete the Gallup Student Poll. The Gallup Student Poll is a 24-item survey that measures engagement, hope, entrepreneurial aspiration and career/financial literacy. Results are reported on a district level with overall U.S. results provided for comparison<sup>3</sup>.

The Student Personalized Learning Survey is administered three times a year during the fall, winter, and spring to students participating in the Personalized Learning Initiative. The survey consists of 13 items that measure student engagement and learning experiences while participating in Personalized Learning.

### Sample

Survey data were collected based on the following criteria. The Personalized Learning Group includes student responses collected from the Student Personalized Learning Survey administered in Spring 2016 (N=2,969). Surveys are administered using a 4-point Likert Scale where 1 = Strongly Disagree and 4 = Strongly Agree.

<sup>3</sup> Gallup Inc. Gallup Student Poll. Washington, D.C.: <http://www.gallupstudentpoll.com/home.aspx>

For this evaluation, to measure the effect of personalized learning on student engagement, seven questions from the Student Personalized Learning Survey were identified as representing the construct of student engagement. For each question, a student’s response was coded as “engaged” if the response was equal to a 3 or 4 , “not engaged” if the response was equal to 2, and “actively not engaged” if the response was equal to 1 (see Table 3). Survey responses were collected from 26 out of the 33 schools from Cohort 2 of the Personalized Learning Initiative.

**Table 3: Items measuring engagement on the Student Personalized Learning Survey**

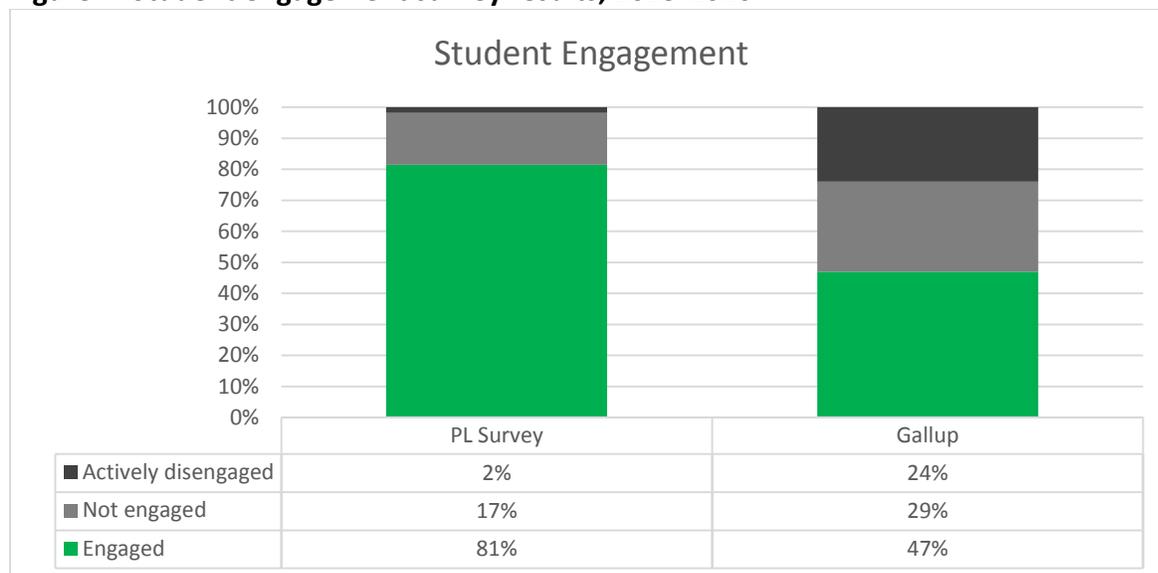
Item Number	Item
4	I work towards building positive relationships with my classmates and community.
5	I demonstrate learner profile characteristics that myself and others can be proud of in and out of school.
8	I know what is expected of me and work toward those expectations.
9	I control the pace of my learning: when I need to accelerate and slow down.
10	I control the path of my learning: I know which next steps to take based on my performance.
11	I feel engaged in my learning.
12	I set goals for my learning.

The Gallup group includes student responses collected from the Gallup Student Poll administered in Fall of 2015 (N=26,548). Surveys are administered using a 5 point Likert Scale with 1 = Strongly Disagree and 4 = Strongly Agree. Based on their responses, students were categorized as either engaged, not engaged, or actively disengaged. Because of the anonymous nature of the Student Personalized Learning Survey and the Gallup Student Poll, there was not a way to connect individual student information (e.g., demographics, grade level, and classroom) to the responses on either survey.

## Results

Results from the Student Personalized Learning Survey indicate that overall, 81% of students from the PL Cohort reported being engaged. In fact, on question 11, “I feel engaged in my learning”, 85% of students reported being engaged. When compared to the Gallup Student Poll, where 47% of students reported being engaged, students who are participating in PL reported being overall engaged at a rate of 72% higher than the Control Group (an increase of 34 percentage points).

**Figure 4: Student engagement survey results, 2015-2016**



## Limitations

### ***Student Math Outcomes***

Because of the small sample size of the PL group (PL  $n=305$ ) when disaggregated by subgroup, the influence of LEP, AIG, and SWD status on NCE growth could not be examined in relation to the other variables. In summary, the final sample of students in this evaluation represents a very stable group of students who participate in a general education program. Thus, we recommend not generalizing the results to the broader CMS population.

Finally, because this study examined the effects of students taking courses from teachers that either received or did not receive have PL training, the correlation between teacher and the PL/control grouping variable made it difficult to isolate teacher influence from PL influence on growth outcomes.

### ***Student Engagement***

Due to reporting standards and guidelines, restrictions were placed on what data was available at the school level from the Gallup Student Poll. If reporting thresholds were not met for specific categories, those response percentages as being engaged, not engaged, or actively disengaged were not included in the data findings.

Additionally, Grand Oak Elementary, Irwin Academic center, Montclair Elementary, Newell Elementary, Piedmont Middle, River Gate Elementary School, Sedgfield Middle, and Winterfield Elementary did not have any reported data on the Gallup Student Poll.

## Conclusion

The results strongly suggest that Personalized Learning has a significant and positive impact on student growth in math and on student engagement. On average, students made larger gains in math growth after taking a course from a PL teacher (+2.32 on the NCE) than students who did not take a course from a PL teacher (+0.60 on the NCE). This effect of PL on average student growth was consistent across schools and the math course taken, and it had a meaningful influence regardless of course and school. Each of these variables also helped to explain the overall mean difference between the 2014 and 2015 math NCE growth scores (see Appendix D).

Future evaluation efforts should include other academic subjects such as reading and science in order to increase the robustness and generalizability of the findings by identifying whether Personalized Learning is effective across multiple subjects. Indeed, increasing the number of outcome metrics used to evaluate effectiveness would allow for a broader interpretation of the effects of personalized learning on student learning.

While the strong results from this analysis suggest the benefits of personalized learning, it would be beneficial to identify whether there is an effect of teacher on growth outcomes. That is, do some teachers have better outcomes than others? Because of the way that the data are nested (students nested in classrooms, and classrooms nested in schools), a nested model (or a “multi-level model”) that accounts for these relationships is recommended for future evaluation activities. In addition, this type of model could incorporate teacher-level variables, such as an EVAAS performance index, in order to evaluate how teacher characteristics influence student results.

It would be advantageous to have a larger sample size. A larger sample would further allow us to assess Personalized Learning through a multi-level model, which would allow us to better differentiate how various schools, teachers, and courses affect NCE growth and the impact of personalized learning.

Finally, a larger sample that allows incorporation of subgroups (e.g., AIG, SWD, and LEP) would increase the external validity of the analysis, thereby allowing greater generalization of the findings.

In summary, the Personalized Learning Initiative shows a measureable positive effect on math growth outcomes and student engagement. Specifically, students who participated in Personalized Learning showed higher levels of math growth as well as engagement in school. The evidence reported here suggests that Personalized Learning offers a positive philosophical model that assists teachers in maximizing their students’ academic potential.

## Appendix A. Personalized Learning Schools by Cohort Year

School Type	School Name	Cohort Year
Elementary	Barringer Academic Center, Devonshire Elementary, Eastover Elementary, Grand Oak Elementary, Hawk Ridge Elementary, Lake Wylie Elementary, Newell Elementary, Pinewood Elementary, Tuckaseegee Elementary, Whitewater Academy	2014-2015
Elementary	Bain Elementary, Highland Creek Elementary, Irwin Academic Center, Long Creek Elementary, Matthews Elementary, Montclair Elementary, Pineville Elementary, River Gate Elementary, River Oaks Academy, Winget Park Elementary, Winterfield Elementary	2015-2016
Elementary	Barnette Elementary, Elon Park Elementary, Huntersville Elementary, Idlewild Elementary, J.V. Washam Elementary, Merry Oaks Elementary, Oakhurst STEAM Academy, Smithfield Elementary	2016-2017
K-8	Ashley Park PreK-8 School, Morehead STEM Academy	2015-2016
Middle School	Carmel Middle, Kennedy Middle, Martin Luther King Jr Middle, Ridge Road Middle	2014-2015
Middle School	Whitewater Middle, Mint Hill Middle, Piedmont IB Middle, Sedgefield Middle	2015-2016
Middle School	McClintock Middle, Randolph Middle	2016-2017
High School	Olympic High - Renaissance School	2014-2015
High School	North Mecklenburg High, Olympic High - Biotech Health Pub Admin	2015-2016
High School	Garinger High, Phillip O Berry Academy of Technology	2016-2017

# Appendix B. Gallup Fall 2015 District Results, Engagement

CHARLOTTE-MECKLENBURG SCHOOLS

FALL 2015

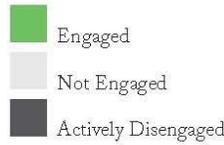
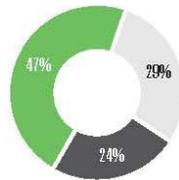


## ENGAGEMENT

THE INVOLVEMENT IN AND ENTHUSIASM FOR SCHOOL.

### ENGAGEMENT INDEX\*

n=26,548



	Your District	U.S. Overall
<b>ENGAGEMENT GRANDMEAN</b>	3.85 n=26,548	3.90 n=867,454
At this school, I get to do what I do best every day.	3.54	3.57
My teachers make me feel my schoolwork is important.	4.09	4.04
I feel safe in this school.	3.77	3.93
I have fun at school.	3.36	3.50
I have a best friend at school.	4.36	4.38
In the last seven days, someone has told me I have done good work at school.	3.66	3.65
In the last seven days, I have learned something interesting at school.	3.90	3.92
The adults at my school care about me.	3.79	3.85
I have at least one teacher who makes me excited about the future.	4.07	4.13

### GRANDMEAN BY GRADE

5th	6th	7th	8th	9th	10th	11th	12th
4.32	4.06	3.75	3.61	3.62	3.43	3.37	3.36

### ITEM RESPONSES

ITEM	TOTAL N	%				
		STRONGLY DISAGREE	%1	%2	%3	STRONGLY AGREE
At this school, I get to do what I do best every day.	27,154	8	10	28	30	25
My teachers make me feel my schoolwork is important.	28,255	6	16	26	48	
I feel safe in this school.	27,817	7	9	20	27	37
I have fun at school.	28,304	13	13	23	24	26
I have a best friend at school.	27,997	7	7	12	70	
In the last seven days, someone has told me I have done good work at school.	26,870	15	9	14	21	41
In the last seven days, I have learned something interesting at school.	27,997	7	7	17	26	43
The adults at my school care about me.	26,637	7	9	20	26	38
I have at least one teacher who makes me excited about the future.	27,573	8	6	12	20	54

\*Minimum n size of 100 required for full index and 30 for percent Engaged only.

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Because of the anonymous nature of the Gallup Student Poll and the Student Personalized Learning Survey, there was not a way to connect individual student information (e.g., demographics, grade level, classroom) to the responses on either survey.

## Appendix C. 2014-15 Personalized Learning School NCE Growth Statistics

2015 NCE Growth Mean and Number of Students at each School by Group							
School Name	Number of Students			Ratio	2015 NCE Growth Mean		
	Total	Control	PL	PL/Control	Control	PL	School
Middle School A	461	374	87	23.26%	2.81	1.8	2.62
Elementary School A	59	48	11	22.92%	-0.32	4.32	0.54
Title 1 Middle School C	383	360	23	6.39%	-3.18	-1.59	-3.09
Title 1 Elem School C	42	21	21	100.00%	-6.1	-2.5	-4.3
Title 1 Elem School D	21	16	5	31.25%	1.85	7.71	3.25
Middle School B	772	651	121	18.59%	1.97	5.08	2.46
Elementary School B	45	40	5	12.50%	-1.16	0.87	-0.93
Title 1 Elem School E <sup>1</sup>	45	45			-2.12		-2.12
Title 1 Elem School F <sup>1</sup>	53	53			2.63		2.63
Title 1 Elem School G <sup>1</sup>	27	27			2.51		2.51
Elementary School G <sup>1</sup>	32		32			-2.08	-2.08
Elementary School I <sup>1</sup>	41	41			0.51		0.51
Elementary School J <sup>1</sup>	54	54			-2.3		-2.3

<sup>1</sup> Had PL program but did not have students with NCE Growth scores for 2014 and 2015 in PL and control groups.