TN Department of Education

2016-17 Blended Learning Pilot Report

Tennessee Department of Education | April 2018

Table of Contents

Pilot Background

One of the priority areas outlined in the department's strategic plan, *Tennessee Succeeds,* is "All Means All," which focuses on "providing individualized support and opportunities for all students with a focus on those who are furthest behind." The focus on individualized support for students directly aligns with the definition of personalized learning developed by the U.S. Department of Education's Office of Educational Technology:

> Personalized Learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) all may vary based on learning needs. In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated. (Thomas, 2016)

Personalized learning is also a major piece of the department's *Every Student Succeeds Act* (ESSA) plan as well. The ESSA plan states that the department will support districts as they explore personalized learning opportunities for students. Included in those opportunities is the work that was already underway in the department, including the blended learning pilot.

In 2015, the department convened a the Personalized Learning Task Force (task force) to explore the ways the department could support districts as they incorporate personalized and blended learning as part of their strategy for providing students with a well-rounded, standards-based education for all students. The task force proposed several pilots based on promising strategies which enable more robust personalized learning but decided to focus on blended learning first.

Pilot Overview and Design

During the 2016-17 school year, the department launched a two-year **Algebra I/Integrated Math I Blended Learning Pilot.** The task force defined blended learning as the combination of strong human teaching strategies and technology-based teaching strategies fused together to strategically personalize learning for students. Blended learning includes the use of computers and other devices as instructional tools, video, and online sites for practice. A blended learning environment also allows students to control some of what they learn. The task force believed that the deliberate, measured incorporation of technology into the classroom would create a

scenario where teachers could leverage the increased student ownership provided by blended learning to differentiate instruction[1] and focus on those students who need the most support.

The task force determined that starting with science, technology, engineering, and math (STEM) courses offered an easier entry point because of prior investments by the department and districts into STEM resources. To leverage the pre-existing STEM and blended learning networks throughout the state, the department opted to run the pilot in Algebra I and Integrated Math I classrooms.

The department designed the pilot to provide an opportunity to explore the extent to which a blended learning environment:

- impacts student proficiency levels in Algebra I and Integrated Math I,
- supports teachers in differentiating and personalizing instruction in their classroom, and
- increases student ownership and buy-in of their learning.

Additionally, the goal of the blended learning pilot was to gain a better understanding of the department's role in blended learning implementation and to determine the extent that:

- internal and external factors help or hinder the implementation of blended learning,
- practices and procedures can be scaled for use throughout the state, and
- blended learning, as a strategy, helps achieve the *Tennessee Succeeds* vision.

To ascertain information about the impact of blended learning and the department's role in its implementation, teachers received access to several important resources. The department did not provide teachers with technology, such as computers or tablets, but they received access to a learning management system (LMS) called Canvas. The LMS allowed teachers to easily transition their offline content and courses to an online environment while simultaneously giving students asynchronous access. By providing teachers and students with access to an LMS, teachers and students were able to engage in organized, asynchronous learning that would allow for more differentiated instruction.

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[1] According to the Tennessee Department of Education's RTI[2] Manual, "Differentiated instruction is a teacher's proactive response to a learner's individual needs; it is an instructional approach that simultaneously encompasses several learning strategies."

The inclusion of the LMS also gave the pilot a consistent environment for all teachers.

Issues with provisioning accounts for students delayed the implementation of Canvas, and teachers were unable to access Canvas until mid-October. Therefore, during year one of the pilot, 42 percent of teachers used Google Classroom for their LMS compared to 33 percent who used Canvas. The remaining 25 percent used either Schoology or a combination of different online tools.

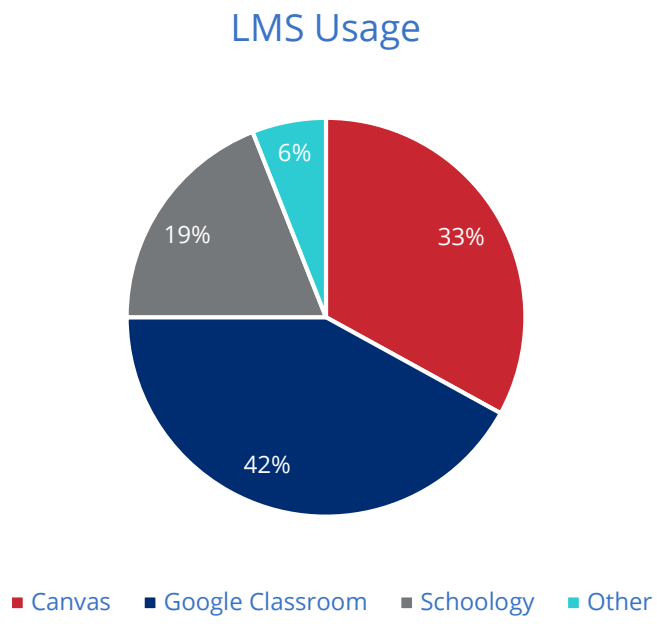

Figure 1: LMS Usage

The department also provided teachers with content that they could easily load into the LMS they were using to mitigate any extra time used during the course of the pilot. The pre-made content supplemented their current content. The department chose to use content from the Networked, Resources, Open, College and Career (NROC) project, because it aligned to the Tennessee Algebra I and Integrated Math I academic standards and was also easy to incorporate into an LMS environment.

Finally, the department provided teachers with personalized learning coaching to help them with their transition to blended learning. Early on, the task force decided that coaching would help teachers, as blended learning is relatively new in the education field. To provide coaching to pilot teachers, the department partnered with BetterLesson.

BetterLesson coaches provided teachers with bi-weekly virtual professional development and video conferences designed to help them transition their classroom from a traditional learning environment to a blended learning environment. During these video conferences, teachers worked with coaches to set goals, investigate techniques to improve their implementation of blended learning, and create lesson plans. Between meetings, teachers collected evidence of their work and presented it to their BetterLesson coach during their meetings as part of the coaching cycle.

Participants

The department recruited volunteer Algebra I and Integrated Math I teachers to participate in the pilot. A total of 50 teachers participated in the pilot: 46 Algebra I teachers and four Integrated Math I teachers, who served a total of 5,319 students (see Table 1 for a gender and racial breakdown of pilot students). Pilot teachers worked in 37 schools—26 high schools and 11 middle schools—in 21 school districts.

Demographic Make-up

		Pilot	Non-Pilot[2]
Gender	Male	51%	52%
	Female	49%	48%
Race	Native American	0.37%	0.33%
	Asian	2.83%	2.25%
	African American	21.42%	24.97%
	Hispanic	11.90%	9.56%
	Hawaiian/Pacific Islander	0.42%	0.17%
	White	63.07%	62.73%

Table 1: Pilot Demographics

Teachers opted in to the pilot by securing approval from the pilot coordinator, principal, and district leader. Additionally, schools signified commitment to participation by submitting a Memorandum of Understanding (MOU). Pilot teachers came from every grand division of the state and represented urban, suburban, and rural schools.

Further, the pilot had teachers with a great deal of diversity in terms of years of experience, TVAAS score, and experience with blended learning. The number of years of experience teaching and using blended learning varied greatly among the pilot teachers. Thirty-six percent

[2] Non-pilot refers to statewide demographics of students not participating in the pilot.

of the pilot's teachers taught five years or less, and 66 percent taught 10 years or less. While many of the teachers in the pilot had experience with blended learning, data collected by BetterLesson show that two-thirds of the pilot teachers had never used blended learning in their classes prior to joining the pilot.

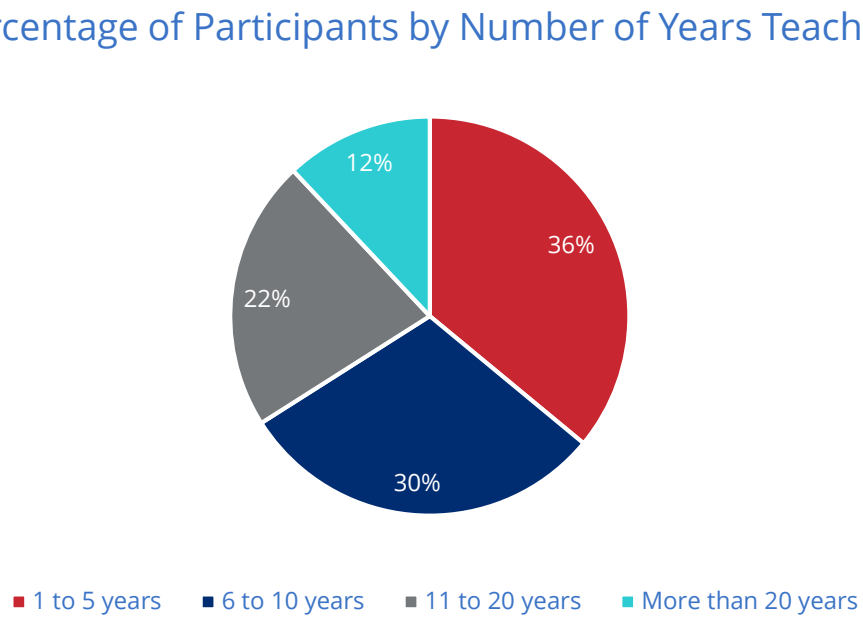

Figure 2: Participants by Number of Years Teaching

Similar to years of experience, TVAAS scores for pilot teachers varied. Forty-four percent scored a five on TVAAS, and an additional 24 percent scored a three or four. Twenty-three percent of teachers scored a one.

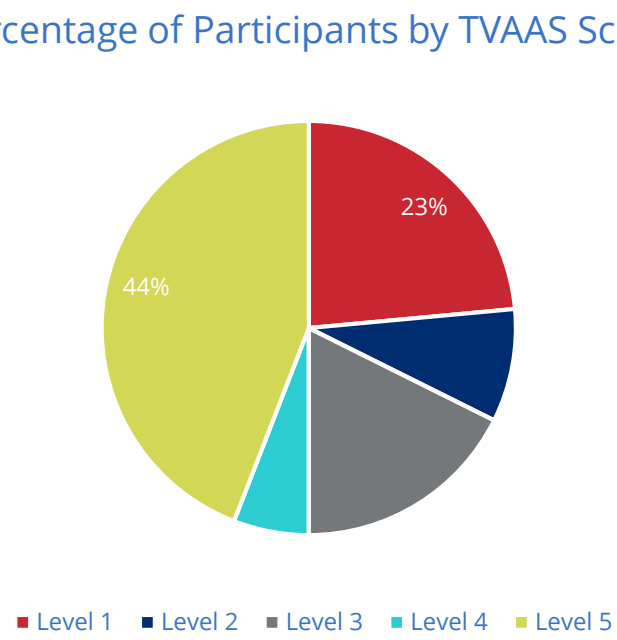

Figure 3: Participants by TVAAS Score

Technology Availability

The pilot MOU required teachers to have access to technology such as computers or tablets during the pilot course, but it did not state a required amount or how often teachers needed to have access to technology. This led to variability in technology access that mirrored the technology access throughout the state. For example, while one school may have access to one-to-one technology, another may only have access to a shared computer lab. During interviews and focus groups, many teachers voiced similar differences.

Data Collection and Assessment

To account for the complex and intricate nature of the pilot, the department gathered and examined both qualitative and quantitative data. Mixed methods made it possible to measure the association between the pilot and changes in student growth, student ownership, and teaching practices. Further, focus groups and interviews contextualized the quantitative data and allowed for in-depth examinations of the mechanisms and practices that triggered the changes made by teachers.

Quantitative Data

The quantitative data gave insights into possible connections between blended learning and changes in teaching practices, academic ownership, and student achievement. Due to the

suspension of the 2015-16 TNReady assessment in grades 3-8, prior year assessment data was unavailable, so data from 2014-15 was used instead.

Standardized Assessment Data

The department used Algebra I and Integrated Math I end-of-course (EOC) assessment data to measure and analyze the performance of pilot students. Tennessee Comprehensive Assessment Program (TCAP) math scores from the 2014-15 school year acted as a control for differences between classes in the pilot and those out of the pilot and for inter-school and inter-district comparisons.

Qualitative Data

The department collected qualitative data to gain an insightful and granular understanding of pilot teachers, their classrooms, and their students. Teachers provided most of the qualitative data, but observers briefly interviewed students during observations as well.

Tennessee Educator Acceleration Model (TEAM) Data

Three years of TEAM data collected for all pilot teachers served as a proxy measure for motivating students, differentiated instruction, and student ownership. The TEAM rubric has elements of blended learning in every indicator, but the department only examined the following six indicators:

- motivating students,
- presenting instructional content,
- activities and materials,
- academic feedback,
- teacher knowledge of students, and
- instructional planning.

Survey Data

Teacher surveys (Appendix A) covered a variety of blended learning topics, including technology access, technology use, and differentiated instruction. The survey data gave insights into:

- how teachers used blended learning technology (computers, tablets, online content, and an LMS) in classrooms,
- how students interacted with technology, and
- which resources and strategies were most effective in a blended learning classroom.

Interviews and Focus Groups

Seven teachers participated in extensive interviews during the school year. The primary criteria for selecting interview participants were regional and community diversity. Interview participants represented all three regions of the state and urban, suburban, and rural communities.

Most teachers participated in one of four regional focus groups, while the rest participated in an online focus group. The focus groups were regionally homogenous because the department attempted to ensure that participants did not have to travel farther than 100 miles to participate. Although the focus groups lacked regional diversity, each one had representatives from urban, suburban, and rural communities.

Observations

The pilot coordinator and other department staff participated in seven formal and six informal observations throughout year. Over the course of the year, multiple department staff members performed informal observations to gather information about pilot classrooms and to inform professional development and resource allocation choices. Formal observations consisted of three parts: a classroom observation, a post-observation interview, and questions for students.

Findings

The purpose of the pilot was to determine if the implementation of blended learning would lead to increased differentiated instruction and student buy-in, which in turn would result in increased achievement scores. Determining if achievement scores increased was an important measure of success for the pilot, but gaining knowledge about the aspects of blended learning that impacted those scores was equally important. To gain a deeper and more robust understanding of the aspects of blended learning, the department undertook an in-depth examination of differentiated instruction, student ownership, and factors that lead to successful implementation.

Student Achievement

Does blended learning increase academic outcomes for students?

One measure of success for the pilot was whether or not blended learning led to increases in student achievement. Student achievement was measured by reviewing and analyzing Algebra I and Integrated Math I end-of-course (EOC) exam scores for pilot and non-pilot students. The

results, taken as a whole, show a **positive relationship between participating in the blended learning pilot and increased test scores**. There are positive indicators for in-school comparisons between pilot students and non-pilot students as well as many subgroups. However, due to small effect sizes and lack of statistical significance in some cases, the results do not support drawing broad conclusions about pilot outcomes. A second year of data collection will allow for further analysis and stronger conclusions.

2016-17 End-of-Course Assessment Score Differences

The primary measurement for academic achievement was 2016-17 Algebra I and Integrated Math I EOC assessment scale scores. The department compared the means of students in the pilot to those not in the pilot to determine if blended learning was associated with a difference in test scores. Research[3] also suggested that blended learning could impact specific sub-groups, including African American students, Hispanic students, Asian students, students with disabilities, and economically disadvantaged students.

Overall, the mean EOC assessment scale score for students in the pilot was around three points higher than non-pilot participants (see Table 2). The result is statistically significant, but the small difference combined with the low effect size indicates that it is not practically significant. African American students, students with disabilities, and economically disadvantaged students also had statistically significant higher means on their EOC assessments than their non-pilot counterparts. The effect sizes for African American students and students with disabilities suggest that the pilot had a small effect on test scores. In practical terms, both groups scored two-tenths of a standard deviation higher than their non-pilot counterparts. The scores for Hispanic and Asian pilot participants were also higher than their non-pilot counterparts, but statistically insignificant.

[3] Cheung & Slavin, 2013; Darling-Hammond, Zielezinski, & Goldman, 2014; Goldberg, Russell, & Cook, 2003; Gulek & Demirtas, 2005; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010

Results of t-tests for EOC scale score by sub-group and pilot status

	Pilot Status								
	Pilot			Non-Pilot					
	M	SD	n	M	SD	n	t	df	Cohen's d
All	302.63	30.48	3,492	299.97	32.26	72,004	-4.77***	75,494	0.08
African American	293.67	27.75	762	286.70	31.00	18,007	-6.10***	18,767	0.23
Hispanic	290.18	32.5	418	289.63	34.29	6,860	-0.32	7,276	0.01
Asian	323.67	35.75	99	322.35	34.09	1,638	-0.37	1,735	0.03
Students with Disabilities	278.25	30.43	319	272.66	30.01	9,154	-3.27**	9,471	0.19
Economically Disadvantaged	292.83	28.00	959	288.20	30.88	24,094	-4.57***	25,051	0.15

**p<.01. ***p<.001

Table 2: Scale Score Comparisons

A comparison of test scores between pilot and non-pilot classes in the same schools shows a large difference in scores. On average, pilot classrooms scored six points higher (SD = 9.39) than their non-pilot counterparts in the same school. Of the 25 schools that had comparison classrooms, only six had pilot students score less than their non-pilot counterparts. While this is a positive indicator, further data collection is necessary to ensure that this is not due to chance.

Key Takeaways

- Students who participated in the pilot scored higher than students who did not. T-tests and measures of effect size indicate that not all of the score differences were statistically or practically significant, but the pattern suggests that pilot participation had a positive impact.

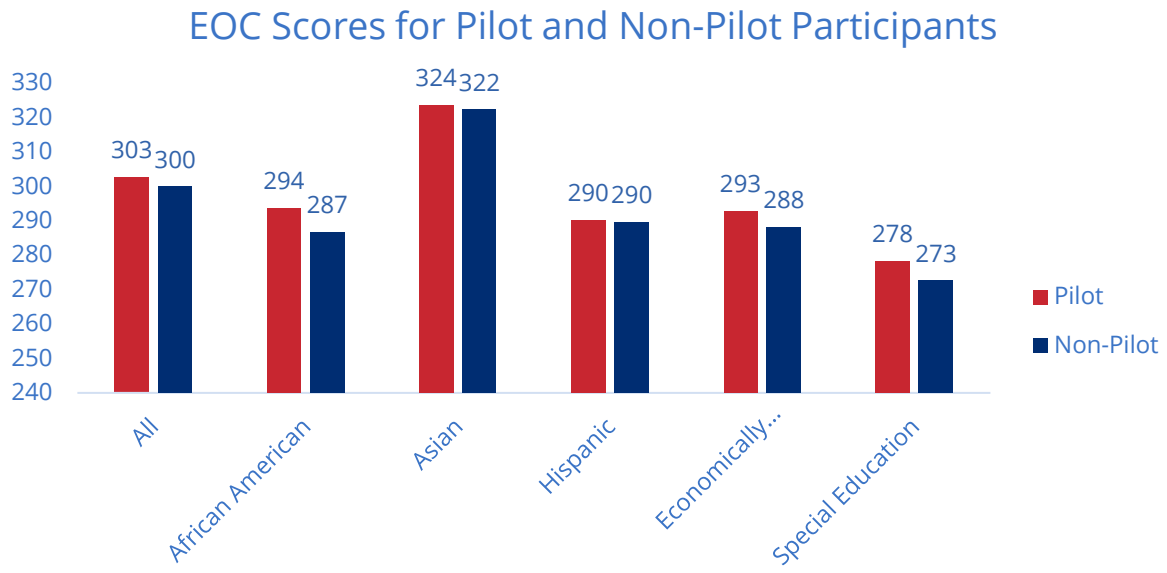

Figure 4: Comparison of EOC Scores for Pilot and Non-pilot Participants

- Prior external research shows that blended learning and technology use in the classroom improves academic outcomes for African American students and students with disabilities. The results for the first year of the pilot align with the external research and indicate that participation in the pilot improved academic outcomes for African American students and students with disabilities.
- Comparisons of students in the pilot to the entire population of Algebra I and Integrated Math I students showed that there was only a small change in scores.

Differentiated Instruction and Personalization

Does implementing blended learning enable teachers to differentiate content for students?

The task force predicted that implementing blended learning into the classroom would allow teachers to differentiate instruction more often and, in turn, increase outcomes for all students. In an attempt to ascertain the quantity and quality of differentiated instruction, the department examined survey data and focus group and interview responses. Qualitative and quantitative data collected throughout the course of the pilot suggests that teachers indeed used differentiated instruction more because of technology and blended learning implementation. Teachers said that access to more technology, training, and support allowed them to incorporate more blended learning activities, like online videos and applications, into their classroom. This increased the amount of differentiation in their classrooms, because students could engage with content independently.

Differentiated Instruction and Blended Learning

Since differentiated instruction is the primary mechanism that blended learning impacts, it was extremely important to have a strong understanding of the interaction between blended learning and differentiated instruction.

Survey responses from teachers showed that the incorporation of blended learning into the classroom allowed teachers to differentiate more often than in previous years. Surveys conducted at the middle and end of the year asked teachers a variety of questions about their use of blended learning and how it impacted their students. A comparison of the mid-year and end-of- -year surveys showed teachers increased the frequency of differentiated instruction as the year progressed. At the end of the first semester, only 30 percent of teachers reported using blended learning to differentiate once a week or more compared to 55 percent at the end

of the second semester. During that same time period, 53 percent of the teachers said they increased differentiated instruction with technology from monthly to once a week or more.

While the data does not completely explain what caused the increase from the first semester to the second semester, coaching and support provided by BetterLesson was likely a factor that led to an increase in differentiated instruction. When asked on the survey if BetterLesson coaches identified practical strategies that support differentiated instruction in their classroom, 87 percent of the teachers agreed or strongly agreed. One teacher said, "It is like a B12 shot every two weeks. It makes me feel supported, like I can do anything." Another teacher said, "The BetterLesson strategies...helped me expand my toolbox." Overall, teachers indicated that BetterLesson helped them implement blended learning in their classroom or implement specific blended learning strategies.

Key Takeaways

- In general, pilot teachers reported differentiating more than in previous years of teaching. At the end of the year, 55 percent of teachers said they used computers and online programs to differentiate at least once a week. This was a 25 percent increase from the end of the first semester.

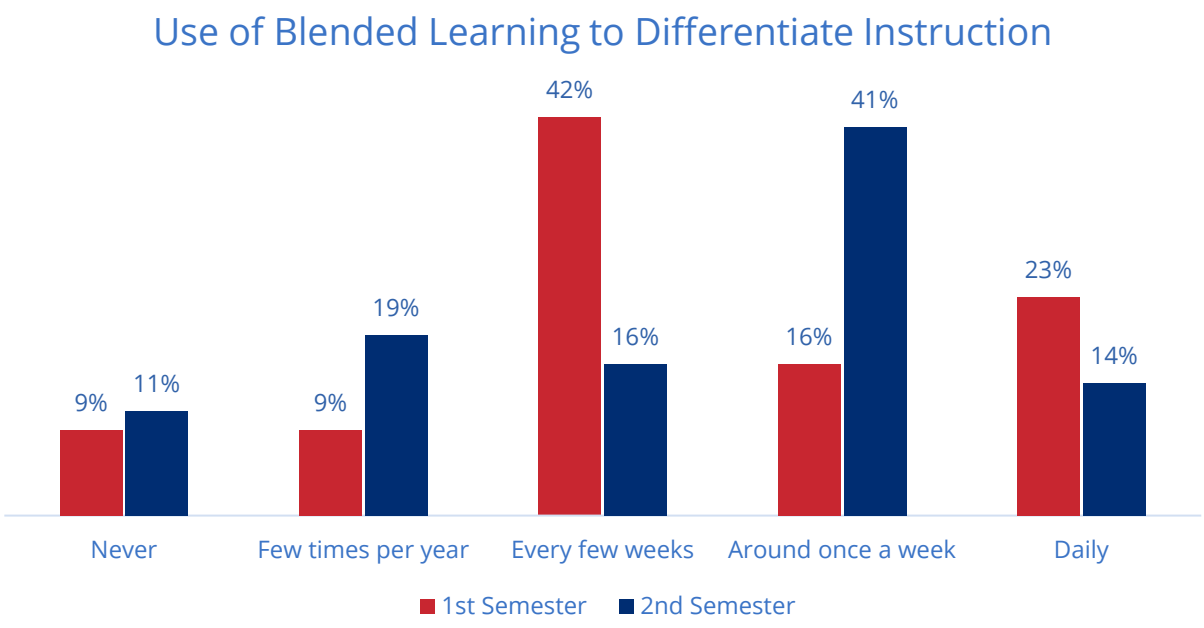

Figure 5: Use of Blended Learning to Differentiate Instruction

- Fifty-three percent of the teachers who reported differentiating using blended learning every few weeks at the end of the first semester reported increasing their use to once a week or more by the end of the school year.
- The training and support that teachers received from BetterLesson may account for some of the increase from the first semester to the second semester. During both focus groups and interviews, several teachers discussed the benefits of coaching they received from BetterLesson.

Impact of Technology Access on Differentiated Instruction

As previously mentioned, the MOU did not specify a required amount of technology for participation, which created a scenario in which technology availability differed from teacher to teacher. Therefore, the department was able to explore the potential impacts of technology access on differentiated instruction.

Teachers who said they significantly increased technology use from previous years of teaching stated that student access to technology was a significant or primary factor in their increased use. Those same teachers also indicated they used technology to differentiate more often. Forty-six percent of teachers said they significantly increased their technology use and differentiated once a week or more. This suggests that a link may exist between technology availability and differentiated instruction.

Key Takeaways

- Teachers who significantly increased their technology use from previous years reported differentiating instruction more often than those that did not increase their technology use. This suggests that access to technology is an important factor for differentiated instruction.

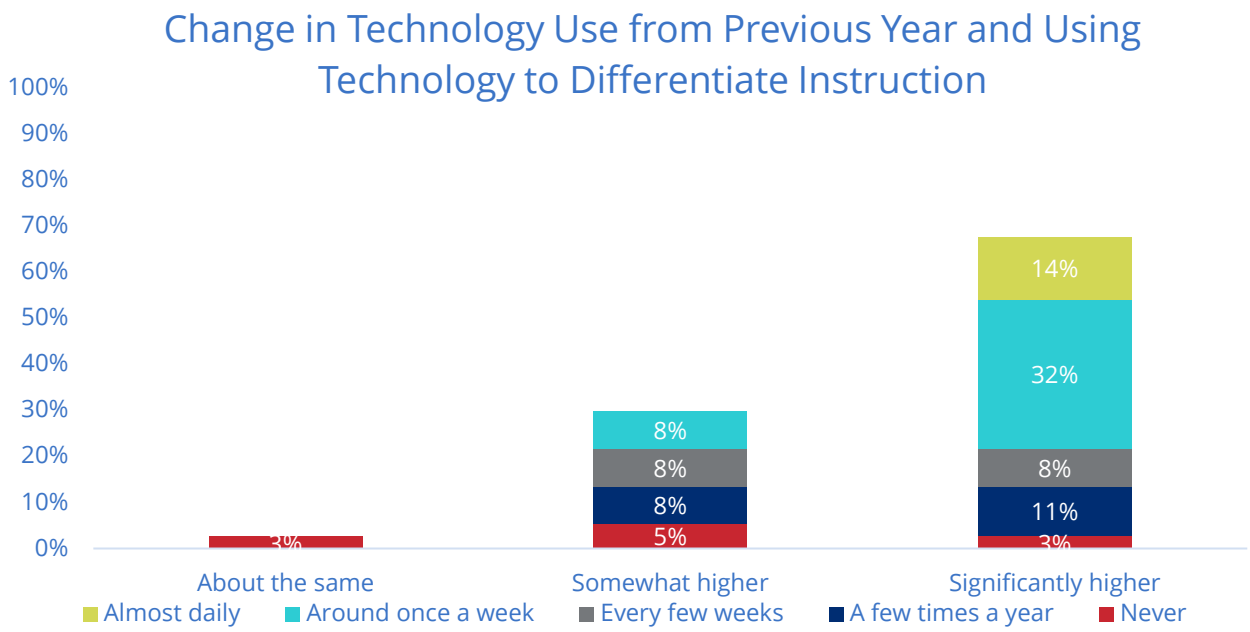

Figure 6: Change in Technology Use and Use of Technology to Differentiate Instruction

- Fifty-four percent of teachers reported using blended learning technology, such as computers and online content, to differentiate *at least* once per week. Fourteen percent said they used blended learning technology to differentiate daily.

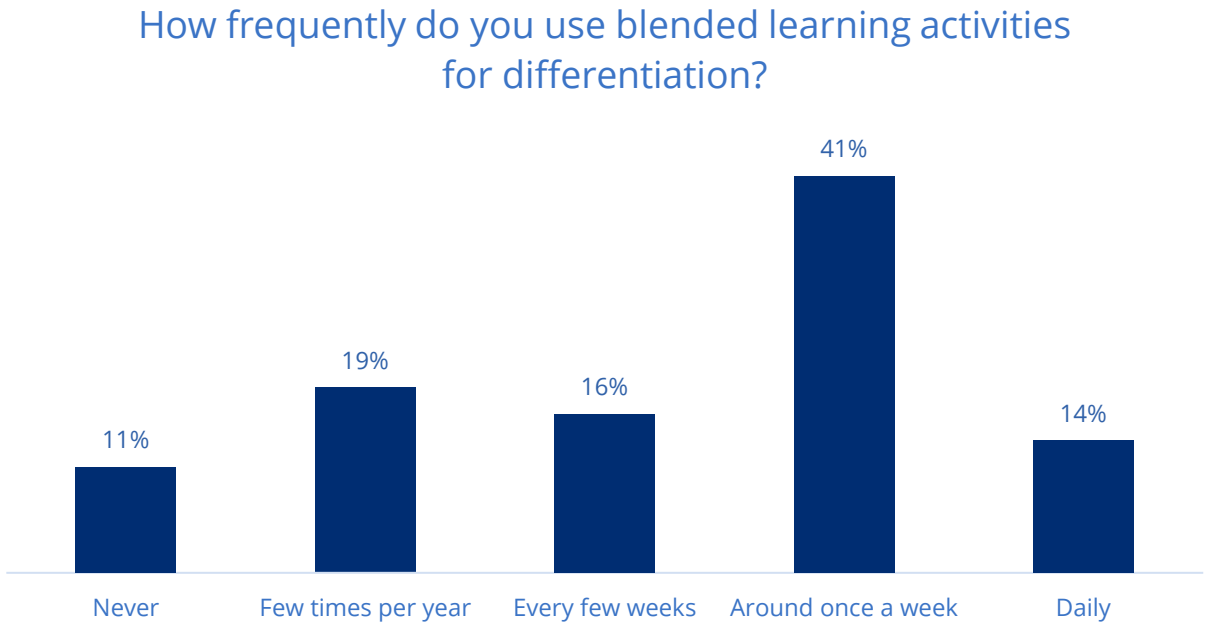

Figure 7: Frequency of Blended Learning for Differentiated instruction

Student Ownership

Does the incorporation of blended learning change student buy-in and ownership of their learning during lessons?

Blended learning has student choice as part of the overall definition, and according to the pilot's hypothesis, incorporating blended learning into the classroom would increase student ownership and buy-in. On mid- and end-of-year surveys and classroom observations, the department asked teachers questions about student ownership and how it compared to previous years. The data indicates that the incorporation of blended learning into the classroom increased student buy-in and ownership of learning. Teachers reported students had a higher level of engagement than in prior years of teaching, and they were able to get students to self-reflect more often because of blended learning. Although student engagement increased, teachers still struggled with allowing students to choose all of their assignments.

Student Engagement

Part of the theory of action that undergirds the hypothesis is the belief that blended learning increases student ownership, which in turn increases academic outcomes. Research[4] shows there is a positive connection between student engagement and ownership. Students who are more engaged in class are more likely to take on harder tasks and seek out more information from teachers and their peers. Pilot teachers reported an increase in student engagement compared to previous years. When asked if engagement had changed from prior years of teaching due to the introduction of blended learning, 84 percent of the pilot teachers reported increased student engagement, and there was a weak, positive correlation (r_s=.38, $p<.05$) between student engagement and how often blended learning was used in class.

Evidence collected during observations and interviews seem to corroborate the idea that students in blended learning classes engaged more with the work and their peers. In multiple classrooms, observers noted that 100 percent of the students were engaged in classroom activities when technology was involved. One teacher explained, "Students are more excited about doing activities on laptops instead of worksheets." Another teacher echoed that sentiment when they said, "I would say engagement increases. I've had a pretty good success rate with [students] being self-motivated when we're using technology."

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[4] Farrington, et al, 2012; Cannata, Smith, & Haynes, 2017

The increase in engagement and ownership was apparent during one of the department's classroom observations when the teacher was struggling to help all of the students in the classroom. While the class was working on computers, the observer noted that students took it upon themselves to get help from their peers. One student was walking around the room helping people, and several others were discussing their questions with other students. These results, coupled with external research on the relationship between engagement and ownership, suggest that the implementation of blended learning does increase student ownership.

Additionally, blended learning allowed *teachers* to increase engagement by providing them with the ability to experiment with different classroom models. The teachers who tried variations, such as the flipped classroom model,[5] reported that students engaged more with the content and took more ownership because the responsibility was on them to learn the content. When discussing using a flipped classroom, one teacher said, "It took a while for [students] to get used to it because they wouldn't do it—like they wouldn't do homework—but now they really like it." Another teacher's comment followed along those same lines when discussing students watching videos the night before a class. She said, "The next day, they aren't getting a full lesson, so they know the importance of looking the night before." Again, this data indicates that blended learning allows teachers to increase engagement and ownership by using a classroom model that is impossible in a traditional environment.

Key Takeaways

- Eighty-four percent of teachers reported increased student engagement during blended learning classes when compared to prior years teaching. The data suggests that part of the increase is due to the incorporation of technology into the classroom.

[5] According to the Vanderbilt Center for Teacher, the flipped classroom model is "a model in which students gain *first-exposure learning* prior to class and focus on the *processing* part of learning (synthesizing, analyzing, problem-solving, etc.) in class."

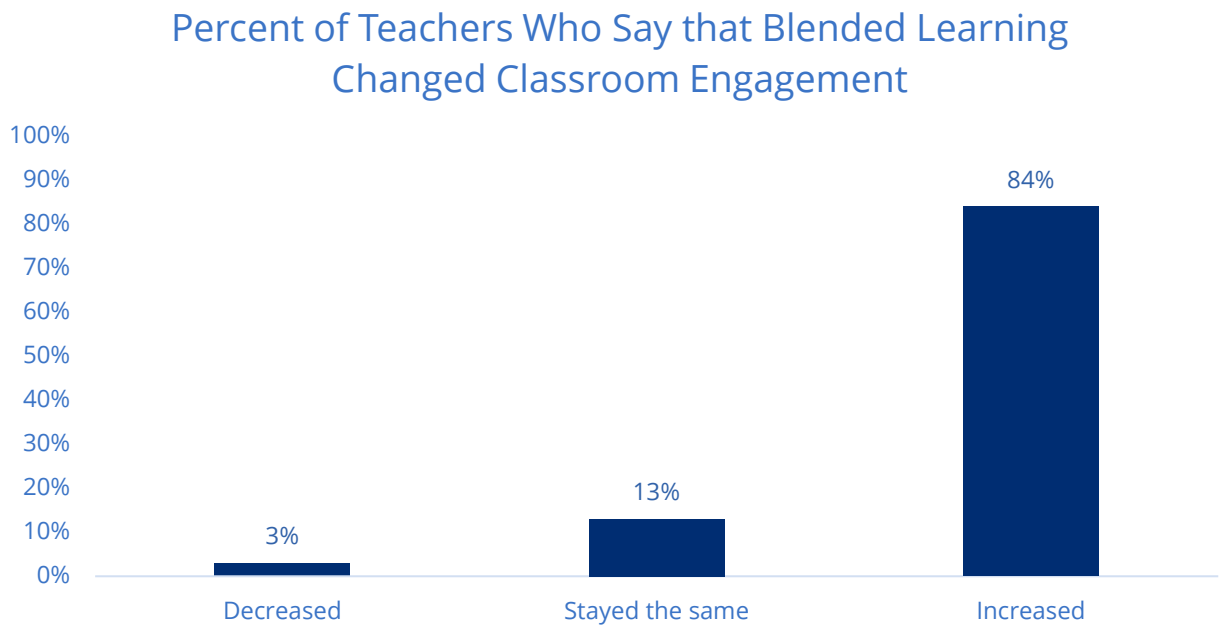

Figure 8: Blended Learning impact on Engagement

- Qualitative data collected during observations, interviews, and focus groups show that pilot student engagement is high. Students actively helped one another and sought out additional resources to help aid in their content acquisition.
- Thoughtful technology use, paired with increasing student responsibility, gets students to engage more in the work and with their peers. Teachers who used blended learning to place the responsibility on students to learn the content before class reported higher student engagement with the work.

Student Reflection

Self-reflection leverages a student's awareness of their levels of achievement and is a powerful tool for improving their academic outcomes[6]. John Hattie (2009) found that students have a "reasonably accurate understanding of their levels of achievement," and a deep understanding of what they do and do not know (p. 43). According to survey data, teachers in the pilot said they used self-reflection more often than in previous years, and there was a strong, positive correlation (r_s=.68, p<.001) between how often teachers used blended learning technology and how often they had students self-reflect. The connection between blended learning technology use and student self-reflections, coupled with the reported increase in the use of self-

[6] McMillan & Hearn, 2008

reflections, shows that blended learning allowed teachers to incorporate proven strategies that improve outcomes.

The biggest impact of blended learning on student self-reflection came from the incorporation of technology into the classroom. Pilot teachers had students reflect more often and provided them with timely feedback, which is critical to improving outcomes. Several teachers reported that they had students use online and paper rubrics to do self-assessments of their work and then make the appropriate modifications. Others said that they used video software to have students explain their work and reply to feedback that they received from the teacher or peers. Regardless of the method used for self-reflection, online surveys, an LMS, and other blended learning technology allowed the teachers to provide timely and substantive feedback.

Teachers reported the biggest hurdle to the incorporation of student self-reflection came from the students' lack of knowledge on how to self-reflect. One teacher explained she had students set goals based on reflection, but her students were "learning to write, modify, and rewrite goals for the next couple of weeks." She said they were struggling because they were "afraid to jump out on their own with goals." When asked why students were afraid of setting their own goals, the teacher said it was because they were interested in comparing themselves to others and not themselves. This data suggests that the opportunity to self-reflect more often is not enough, and teachers must take time to teach students how to do it.

Key Takeaways

- Teachers reported having students complete more self-reflection than in prior years, and a positive correlation exists between self-reflection and the frequency of blended learning technology use in the classroom. Teacher responses in interviews and focus groups show that this is partially attributable to technology making it easier to self-reflect.
- Even though implementing blended learning in the classroom allowed for more self-reflection, teachers stated that students lacked the necessary skills to do it well. In order to maximize the benefit that comes from more self-reflection, teachers must take time to teach students to do it effectively.

Choosing Assignments

Very few teachers in the pilot allowed their students to choose what, when, or how they learned content even though that was one of the goals of the pilot. Instead, teachers used a traditional teaching structure where they planned all content and students followed along. When asked how often they used blended learning to allow students to choose their own way of learning, 68 percent said monthly or less, compared to 32 percent who said once a week or more. Most

teachers used technology to supplement traditional instruction. For example, many provided students with traditional direct instruction; then, students posted their notes or videos of the lesson online.

However, blended learning afforded some opportunities for students to make choices and take control of their education. For instance, in conversations with students during observations, they said they liked video content because it provided them with the opportunity to learn without having to ask the teacher or a peer for help. Along that same vein, another student told the observer, "I search for math help in whatever the topic we're working on and see what videos I can find." Small choices like these show that students are willing and capable to make positive choices about their education when given an opportunity. Finally, the incorporation of blended learning and technology into the classroom removed barriers that prevented students from controlling how much practice they did or from looking ahead and previewing upcoming work. One student said, "Usually I just do more practice problems or retake quizzes when that's allowed." A different student said they liked having access to online resources because it let them look ahead; they said, "Sometimes I go on IXL and see how hard the questions can get."

Key Takeaways

- Even with technology and training, teachers preferred to control the content and pace of their classroom. Sixty-eight percent of the teachers in the pilot said they only used blended learning to empower students to choose which assignments they wanted to work on once a month or less.
- Students and teachers both spoke highly of the use of video as an instructional aid and resource. Both groups pointed out benefits, such as being able to review on their own, slow down when they needed to, or find more information.
- The use of technology and blended learning, combined with an increase in student agency, allowed students to explore their course work and choose the skills they believed needed the most work.

Successful Implementation of Blended Learning

What factors lead to successful implementation of blended learning?

As part of the pilot, the department provided teachers with several resources to help them implement blended learning into their classroom. By giving teachers these tools, the department hoped to learn about how each one affected blended learning implementation and what was necessary for successful implementation. The department collected data about technology access, LMS use, pre-made content, and coaching via survey, focus groups, and interviews. Analysis of the data showed that the primary factors that lead to implementation of blended learning fall into two categories: technology and training. Teachers said it was vital to have access to as much technology as possible, but training was also important. They indicated they needed training on how traditional teaching fundamentals, such as behavior management and classroom routines, looked in a blended learning environment.

Technology

Technology is an obvious requirement for successful implementation of blended learning because the definition of blended learning is "the combination of strong human teaching strategies and technology-based teaching strategies." The survey that teachers completed at the end of the year had a series of questions that asked them how much of a factor technology access, BetterLesson coaching, Canvas access, and NROC access was in implementing blended learning. When asked about technology access, 68 percent of the teachers said access to more technology was a significant or primary factor. This is in comparison to 38 percent who said the same thing for BetterLesson, 14 percent for NROC, and 26 percent for having access to an LMS.

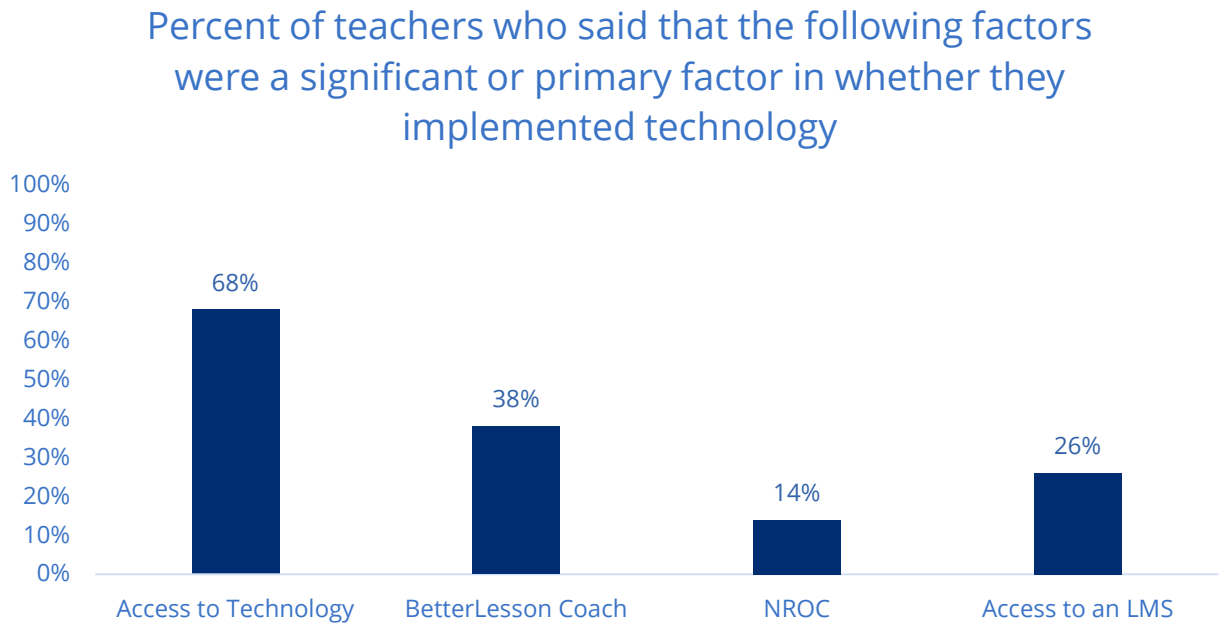

Figure 9: Percent of teachers who said that the following factors were a significant or primary factor in whether they implemented technology

While many teachers liked the content, they said during focus groups and interviews that they did not know how to use it or incorporate it into their LMS. In response to questions about how frequently they use NROC for various tasks, such as providing direct instruction, differentiating content, providing remediation, and collaborating with students, most teachers said they never used the NROC resources (see Table 3).

How often do you use NROC for the following:					
	Never	Few times a year	Monthly	Weekly	Daily
Providing Direct Instruction	86%	10%	4%	0%	0%
Differentiating Instruction	76%	15%	9%	0%	0%
Diagnosing Student Needs	89%	5%	5%	0%	0%
Remediating Content	81%	5%	14%	0%	0%
Providing Students with Practice	81%	10%	9%	0%	0%
Having Students Collaborate	95%	5%	0%	0%	0%
Providing student with choice	89%	5%	5%	0%	0%

Table 3: NROC Usage

Teachers also said that a strong technology infrastructure, such as stable internet connections and working wireless access, was vital to the implementation of blended learning. Several teachers talked about how their schools improved their infrastructure ahead of the pilot rollout, and they believed that contributed to the successes they had implementing blended learning.

Other teachers pointed out that if technology did not work, it could adversely affect a lesson and thereby discourage further use of technology.

Finally, teachers expressed that using a universal LMS throughout the entire school year was important for successful implementation of blended learning. One teacher explained, "[Our LMS] is used throughout the school. They're able to use it quickly just because they see it in almost every single classroom." A consistent LMS removed barriers, such as teaching students how to use the program, which cut down the amount of class time teachers had to use to get students acclimated to the program.

Key Takeaways

- Effective blended learning requires that teachers and students have access to technology such as computers, Chromebooks, or iPads as often as possible. Pilot teachers indicated that access to technology was more important than coaching, content, or a management system when it comes to implementing blended learning.
- Although access to technology is a key factor in the success of implementing blended learning, teachers also stressed the importance of strong infrastructure. Unstable or weak internet connections can disrupt and derail lessons, and it can prevent teachers from fully implementing blended learning.
- Having an LMS that everyone in the school uses helps students transition to blended learning. When students have consistency in terms of their LMS, teachers use less time and do less work to get them acclimated to blended learning.

Training

Teachers expressed apprehension in multiple interviews and focus groups about the possibility of losing control of their classroom. Many teachers also expressed concerns around classroom culture and expectations. A common theme that several teachers brought up was the need for monitoring software. They believed it was necessary to monitor student activities to prevent students from getting off-task and using the technology inappropriately.

More broadly, teachers said they needed more training on how to effectively use technology for blended learning. One teacher said, "I feel that to some extent my own need to learn how to do blended learning is holding things back. After all, kids take to things quickly once presented to them." Other teachers said they struggled with finding and using blended learning tools. During a focus group, one teacher stated, "...it is time-consuming to learn all the tools. I chose a couple I wanted to be good at and now I feel good about that." These pieces of feedback point toward

the need for teachers to have a more focused approach to blended learning and a stronger vision about what to expect in the classroom after implementation.

Finally, teachers also suggested that access to BetterLesson coaches mitigated some of the issues that cropped up around using computers, online content, and other blended learning technology and tool use. On the whole, teachers believed BetterLesson helped them with their blended learning implementation. Feedback from teachers about BetterLesson suggests that ongoing support is necessary to simultaneously fill in gaps in training and push teachers to try new things.

One potential stumbling block that teachers found was student technology knowledge. According to many teachers, students need training on how to use technology for academic purposes. As one teacher explained, "Most of our students have only had a typing class, so it might be a matter of them not being sure what to do with the technology instead of taking that leap into guiding their learning." This sentiment suggests that students cannot access the full potential of blended learning until they understand how to use technology for their education.

Key Takeaways

- To effectively implement blended learning, teachers must have a strong grasp on teaching fundamentals such as classroom management. This means that any rollout of blended learning needs to contain professional development on fundamental teaching practices.
- Training on classroom culture and high expectations is also necessary for strong implementation of blended learning. Technology introduces a new variable into the classroom, and teachers need to ensure their students know about the changes. If they do not, as one teacher stated, they will have “trouble with students going to gaming sites" or otherwise getting off task.
- It is important to develop a plan for blended learning that ensures teachers receive training on the use of blended learning technology (i.e., computers and tablets) and tools (i.e., LMS and online learning programs) in the classroom. Any school or district planning on implementing blended learning should pair training with ongoing support that reinforces prior training while helping teachers try new approaches.
- Students are well equipped to use technology in their everyday lives, but academic use requires training on how to use it in a classroom setting. Using class time to teach students how to use technology can remove barriers to effective use and help with management and expectations.

Conclusion

The first year of the pilot (2016-17) provided promising results around blended and personalized learning, and students and teachers were positive about their experience with blended learning. Because of the pilot, the department is more familiar with the effects of blended learning and how it impacts differentiated instruction and student ownership. Pilot teachers reported that they were able to differentiate more and that there was more engagement in classroom activities. They also said they took advantage of technology resources to give more feedback and have students self-reflect on their work and their progress.

The data on student achievement was not as clear. Results from the first year indicate that there was a small, but positive, connection between blended learning and academic achievement. A comparison of pilot and non-pilot students in the same school showed that pilot students performed better than their peers in the same course. At the same time, a review of different demographic groups showed that blended learning may have an even bigger impact on underserved groups.

While there is no doubt that the lessons learned throughout the course of the pilot will be useful to Tennessee schools and educators who are considering implementing a blended learning program, the overall picture is still unclear. The department is conducting a second year of the pilot (2017-18) in order to collect more data around blended learning and student outcomes. Findings from 2017-18 will be shared when they are available.

Recommendations for Implementing Blended Learning

Schools that are planning on developing and incorporating a blended learning model should develop plans that are thoughtful about technology availability, use, and training. Before moving too quickly into the realm of blended learning, districts and schools must ensure that they have a vision for what blended learning will look like and what outcomes they expect. Districts should consider developing a training plan that includes more than just technology. Their plan should include pre-service training, school-based training, and ongoing training after year one. Schools also need to determine their expectation for technology use in the classroom and develop a plan to train students on those expectations. By focusing on student technology knowledge early in the process, schools can save time and develop a culture of high expectations for technology behavior. Finally, schools should choose a consistent set of tools, including an LMS that everyone will use. By intentionally choosing tools early, districts can ensure stakeholders receive training on how to use them and also save time by eliminating user confusion. The lessons learned from the first year of the pilot have informed the department's approach to improving teacher supports for the second year of the pilot.

For the second year of the pilot, the department will look for promising practices from schools that implemented blended learning for two consecutive years, synthesize state-level key takeaways, and produce a tool kit for other schools that may be interested in implementing blended learning.

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Appendix A

Teachers completed the following survey at the mid-point of the year and the end of the year. The data collected from both surveys was compiled and compared to determine the impact that blended learning had on academic outcomes.

1. Please indicate which LMS you use. If your school primarily uses a learning management system (LMS) other than Canvas, please answer all survey questions regarding Canvas in terms of your primary LMS.
2. Where do you use blended learning technology (e.g., laptops, tablets, online content, digital tools/applications) to support your Algebra I/Integrated Math I students?
3. What percentage of your weekly class time this year is typically spent using blended learning technology?
4. How does the percentage of class time spent using technology this year compare to first semester?
5. How does the percentage of class time spent using technology this year compared to previous years?
6. From your perspective, how have the following factors contributed to any changes in the percentage of class time using technology this year compared to previous years? (Increased student access to technology (laptops, tablets, computer labs))
7. From your perspective, how have the following factors contributed to any changes in the percentage of class time using technology this year compared to previous years? (Access to Canvas (or your native LMS))
8. From your perspective, how have the following factors contributed to any changes in the percentage of class time using technology this year compared to previous years? (Access to NROC content)
9. From your perspective, how have the following factors contributed to any changes in the percentage of class time using technology this year compared to previous years? (BetterLesson coaching)
10. From your perspective, have blended learning activities increased or decreased student engagement and motivation compared to non-technology-based activities used in years past?
11. How frequently do you use blended learning technology for the following activities in your class? (Assigning and submitting homework)
12. How frequently do you use blended learning technology for the following activities in your class? (Delivering whole group instruction)
13. How frequently do you use blended learning technology for the following activities in your class? (Delivering differentiated instruction)
14. How frequently do you use blended learning technology for the following activities in your class? (Grading assignments)
15. How frequently do you use blended learning technology for the following activities in your class? (Conducting independent practice)
16. How frequently do you use blended learning technology for the following activities in your class? (Conducting collaborative activities)

17. How frequently do you use blended learning technology for the following activities in your class? (Conducting goal-setting and reflection activities)
18. How frequently do you use blended learning technology for the following activities in your class? (Providing students with opportunities to select how they learn topics)
19. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Assigning and submitting homework)
20. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Delivering whole group instruction)
21. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Delivering differentiated instruction)
22. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Grading assignments)
23. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Conducting independent practice)
24. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Conducting collaborative activities)
25. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Conducting goal-setting and reflection activities)
26. When you do use blended learning technology, what percentage of the time do you use Canvas (or your native LMS) to facilitate the following activities in your class? (Providing students with opportunities to select how they learn topics)
27. Compared to previous years, has Canvas (or your native LMS) provided more or less opportunities for the following activities in your class (Delivering differentiated instruction)
28. Compared to previous years, has Canvas (or your native LMS) provided more or less opportunities for the following activities in your class (Conducting collaborative activities)
29. Compared to previous years, has Canvas (or your native LMS) provided more or less opportunities for the following activities in your class (Conducting goal-setting and reflection activities)
30. Compared to previous years, has Canvas (or your native LMS) provided more or less opportunities for the following activities in your class (Providing students with opportunities to select how they learn topics)
31. How frequently do you use NROC content for the following instructional purposes? (Delivering direct instruction)
32. How frequently do you use NROC content for the following instructional purposes? (Delivering differentiated instruction)

33. How frequently do you use NROC content for the following instructional purposes? (Diagnosing student learning needs)
34. How frequently do you use NROC content for the following instructional purposes? (Providing remediation)
35. How frequently do you use NROC content for the following instructional purposes? (Providing students more time to practice a concept)
36. How frequently do you use NROC content for the following instructional purposes? (Conducting collaborative activities)
37. How frequently do you use NROC content for the following instructional purposes? (Providing students with opportunities to select how they learn topics)
38. How frequently do you use NROC content for the following instructional purposes? (Serving as a content bank for assignments and assessments)
39. From your experience, to what extent do you agree with the following statements about NROC content? (NROC content communicates objectives to students in a clear, concise manner)
40. From your experience, to what extent do you agree with the following statements about NROC content? (NROC content has increased my ability to differentiate instruction compared to previous years)
41. From your experience, to what extent do you agree with the following statements about NROC content? (In general, my students are more engaged with NROC content than with non-technology-based activities)
42. From your experience, to what extent do you agree with the following statements about NROC content? (NROC content matches the rigor of the expectations of Tennessee's academic standards)
43. From your experience, to what extent do you agree with the following statements about NROC content? (NROC content supports my students in progressing towards mastery of Tennessee's academic standards)
44. To what extent do you agree with the following statements about your BetterLesson coaching? (My coach has a good understanding of what goes on in my classroom)
45. To what extent do you agree with the following statements about your BetterLesson coaching? (My coach has identified practical strategies to address my teaching challenges)
46. To what extent do you agree with the following statements about your BetterLesson coaching? (My coach has identified practical strategies that support differentiated instruction)
47. To what extent do you agree with the following statements about your BetterLesson coaching? (My coach has identified practical strategies that support implementing blended learning in my classroom)
48. To what extent do you agree with the following statements about your BetterLesson coaching? (I am confident in using Canvas to implement the strategies my coach recommends)
49. Will you be participating in the 2017-18 Blended Learning Pilot? If yes, why? If no, why are you choosing to stop your participation?
50. What is one "a-ha" moment or best practice you would like to share about incorporating blended learning into your classroom?
51. What will you do differently next year around the integration of technology in your classroom?