



ASSISTments Use During In-Person and Remote Instruction: A Case Study

The William and Ida Friday Institute for Educational Innovation

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Jamie Gillespie, Ph.D.

Kevin Winn, Ph.D.

Malinda Faber, MPA

NC STATE
UNIVERSITY

College of Education
Friday Institute for Educational Innovation

Executive Summary

The NC ASSISTments Replication Study began in the 2017-18 school year and aimed to replicate the findings from a prior study conducted in Maine. That study found that the students of 7th-grade mathematics teachers who used ASSISTments for homework scored significantly higher on the Terra Nova mathematics exam than the students of teachers who did not use ASSISTments. Unfortunately, the COVID-19 pandemic forced North Carolina's schools to move to all-remote instruction in March of 2020, and the End-of-Grade exams were canceled, which made the replication study impossible to complete. This forced a change in the ASSISTments study, and a re-evaluation of what researchers could learn about the use of ASSISTments in schools in North Carolina. Using surveys and interviews, researchers at the Friday Institute for Educational Innovation conducted a case study of teachers' use of ASSISTments in in-person instruction and in remote instruction, both during the NC ASSISTments Replication Study and outside of the study.

Study Findings

Q1. How did teachers implement ASSISTments during the NC ASSISTments replication study, prior to COVID-19 and with COVID-19?

- **Teachers' use of ASSISTments did not significantly change from in-person to remote instruction.**

Survey and interview findings indicated teachers used ASSISTments primarily for classwork and for homework, both in person and remotely. It was also used, less commonly, for assessment.

- **ASSISTments reports were used to complete steps 3 and 4 of the Four Steps of Independent Practice.**

The ASSISTments reports were used by teachers to identify which problems to review with students and to drive class discussions regarding the problems reviewed together.

- **Technology issues and local requirements were sometimes obstacles to ASSISTments use.**

Many teachers shared that their students had difficulties accessing ASSISTments due to technical limitations, such as a lack of digital devices or a lack of reliable internet access. This was more prevalent during in-person instruction, but remained a problem in some schools during remote instruction, even after many schools provided students with digital devices and hot spots.

Q2. How did ASSISTments affect teachers' instructional practices during the NC ASSISTments replication study, before COVID-19 and with COVID-19?

- **ASSISTments changed how teachers determined if their students had understood lessons.**

The ASSISTments reports were used by teachers to determine the overall success of lessons and to home in on which parts of their lessons students had struggled with.

- **Teachers used ASSISTments reports to adjust their instruction.**

Teachers reported using the ASSISTments reports to write or adjust their lesson plans, to respond to the ASSISTments reports with skill reviews and/or to create small groups for individualized instruction.

- **Teachers' attitudes toward homework changed with ASSISTments use.**

Some teachers shared that using ASSISTments had affected how they viewed and used homework in their instruction. They said that homework became more valuable to them because of the feedback provided to students and because the reports helped them plan follow-up instruction.

Recommendations

Design a drawing tool. ASSISTments users would value an in-program drawing tool. Some ASSISTments problems require students to upload pictures of their work, which can lead to difficulties for users. Some students and parents had difficulty using the upload tool, and teachers were sometimes unable to explain how to do it when teaching remotely. This contributed to teachers using other programs, such as Nearpod, which offered them more options and flexibility.

Ensure ASSISTments has a uniform appearance across devices. A small number of users noted that they faced difficulties assisting their students remotely because the program looked different across device types. This made using ASSISTments difficult in a remote environment, especially when teachers tried helping parents and students who struggled with the program. Teachers realized that what they saw on their screen was not the same as what was on their student's screen. As consistency of platform appearance across all device types would benefit ASSISTments users, ASSISTments may want to consider developing an app that students and parents could access easily.

Continue to solicit feedback from users. During data collection for this study, researchers heard from teachers about things they'd like to see added to ASSISTments and ways that ASSISTments was difficult for them to use. ASSISTments should continue to regularly ask users for their feedback about the platform. This practice has already led to improvements in the platform, helping drive the third iteration (Fresh New Look). It would be beneficial to ASSISTments to have a users' group to consult regularly, whether through surveys, interviews, or group discussions. If ASSISTments can regularly hear from teachers using ASSISTments with their students, the platform will be able to respond to issues, provide features teachers need, and remain a useful tool.

Address varied understandings of formative assessments. Survey results and interview findings revealed that teachers have vastly different conceptions of, and definitions for, formative assessments. ASSISTments should address these various understandings so that teachers are using a common language, which could lead to less confusion. ASSISTments could produce and feature introductory video tutorial explanations of formative assessment on the ASSISTments website. ASSISTments should also consider creating a short professional development module to help teachers understand what formative assessments are and the many ways they can be used.

Investigate further teachers' uses of ASSISTments in both remote and in-person instruction. Teachers shared, via the survey and interviews, that they used ASSISTments in the same ways whether they were teaching in person or remotely. This presents an opportunity to dive deeper into the uses of ASSISTments in both contexts, and to learn whether this finding could be replicated in other locations and conditions. This finding indicates ASSISTments has the potential to support teachers and students in multiple learning environments and to become an important tool for instruction, whether in person or remotely.

Introduction

The NC ASSISTments Replication Study

Researchers at the Friday Institute for Educational Innovation (The Friday Institute) have been a part of the NC ASSISTments Replication Study since 2017 (IES Award #R305A170641). This research sought to recreate in North Carolina a study completed in Maine on the efficacy of a program called ASSISTments – a free online learning tool that provides teachers with formative assessment data to tailor instruction to their students’ needs. The original study focused on 7th-grade mathematics teachers who used ASSISTments for homework and found that ASSISTments significantly increased student achievement and changed teachers’ instructional practices (Roschelle, et al, 2016). Students whose teachers used ASSISTments scored significantly higher on the Terra Nova test, and teachers who used ASSISTments instituted more focused homework reviews during class time. The replication study in North Carolina also focused on 7th-grade mathematics classrooms, and student achievement was to be measured using the North Carolina End-of-Grade exam.

Teachers who were part of the NC ASSISTments study began using ASSISTments during the 2018-19 school year as the “warm-up year” of the study. They were trained in how to use ASSISTments during the summer of 2018, and they received individual assistance in using ASSISTments throughout the 2018-19 school year from the local ASSISTments coach. Data collection during the warm-up year included teacher surveys, interviews with teachers and principals, and classroom observations. These data collection efforts focused on understanding how teachers were using ASSISTments and identifying any obstacles to its use. Researchers also looked for evidence of teachers’ use of the Four Steps of Independent Practice, as detailed by ASSISTments: (1) Teacher assigns content; (2) Students engage with content; (3) Teacher reviews results; and (4) Teacher and students review results together. These steps fuel the ASSISTments theory of change (Figure 1) and are the basic steps of formative assessment.

The bulk of data collection for the NC ASSISTments Replication Study was to take place during the 2019-20 school year, the second year of teachers’ use of ASSISTments. Researchers collected data using surveys, classroom observations, teacher logs, and interviews. Unfortunately, because the pandemic caused schools in North Carolina to move to remote instruction in March and all End-of-Grade exams were canceled, researchers were unable to collect the 7th-grade mathematics End-of-Grade results. This necessitated changes to the NC ASSISTments Replication Study plan. As part of those changes, The Friday Institute members of the Program Evaluation and Education Research (PEER) team completed a case study exploring how ASSISTments was used during in-person and remote instruction and how, if at all, the use of ASSISTments changed teachers’ instructional practices. For this case study, researchers administered a survey to all teachers in North Carolina who used ASSISTments, both those in the NC ASSISTments Replication Study and those who were not part of that study but had used ASSISTments with their classes. From the survey responses, they identified teachers to interview in depth about their use of ASSISTments.

Guiding Questions and Study Design

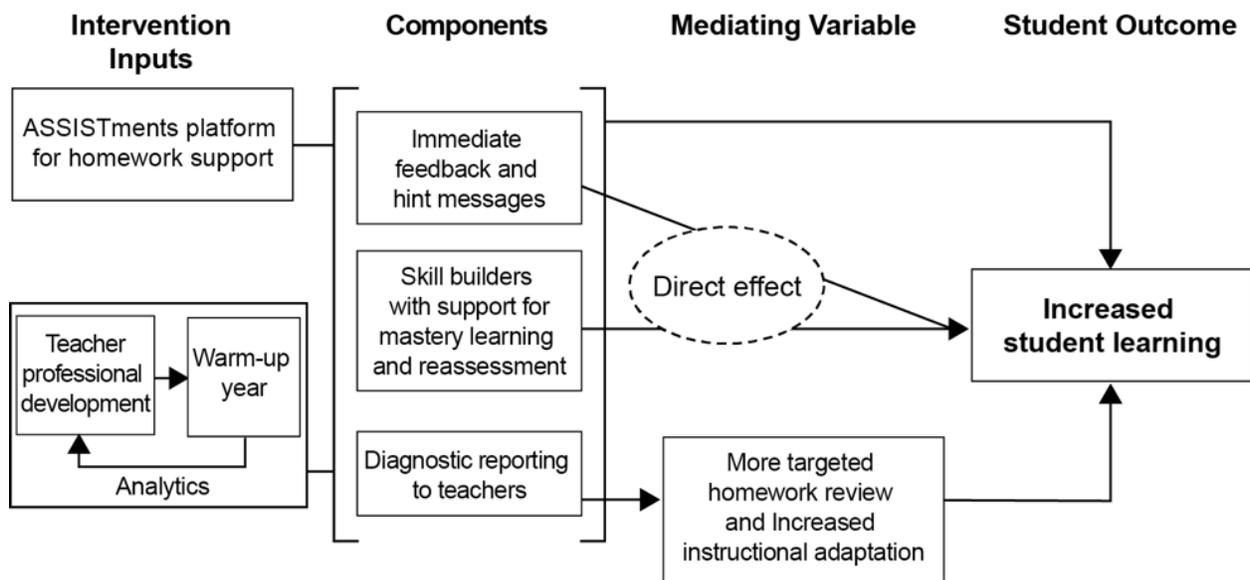
To examine the uses of ASSISTments among teachers in North Carolina, in both in-person and remote instruction, the two overarching study questions focused on comparing and contrasting the implementation and impact of ASSISTments in two different time periods, or cases: before the COVID-19 pandemic and during the COVID-19 pandemic. The first question explored teachers’ practices when using ASSISTments and the contexts of their use. The second question assessed the impact of ASSISTments on teachers’ instructional practices. The study questions were also designed to ensure continuity with previous work by the PEER team as part of the NC ASSISTments Replication Study (see Appendix A for the full set of study questions).

1. **Implementation:** How did teachers implement ASSISTments during the NC ASSISTments study, prior to COVID-19 and during COVID-19?
1. **Impact:** How did ASSISTments affect teachers’ instructional practices during the NC ASSISTments study, before COVID-19 and during COVID-19?

To explore these questions, this study was designed as an intrinsic, longitudinal multiple-case study (Yin, 2014). The intent was to enhance understanding of two situations, or cases: the implementation of ASSISTments by 7th-grade mathematics teachers in the NC ASSISTments Replication Study over the length of the study, and the implementation of ASSISTments by teachers during remote instruction.

The study investigated the ASSISTments’ theory of change (Figure 1) by gathering data pertaining to the use of the “ASSISTments platform for homework support,” leading to “more targeted homework review and increased instructional adaptation.” The use of multiple sources of data – survey and interview – made this a strong case study, giving us opportunities to discover “converging lines of inquiry” (Yin, 2014, p. 120). Results from both instruments were triangulated to answer study questions. The conclusions derived from these multiple sources of data have strong construct validity, supporting the ASSISTments theory of change.

Figure 1. ASSISTments Theory of Change for NC ASSISTments Replication Study



Data Sources

Survey of Teachers’ Use of ASSISTments. A survey was administered in November of 2020. The survey asked participants if they had used ASSISTments during in-person instruction, remote instruction, or both, and how they had used ASSISTments (class work, homework, assessments, other), as well as their plans for future use. Participants were asked to reflect on factors that made using ASSISTments difficult or easy, as well as general questions about formative assessments. (See Appendix B for the full survey.) Participants were given gift cards for completing the survey.

In-Depth Teacher Interviews. Interviews were conducted in March and April of 2021. Interview questions encouraged teachers to reflect on their experiences using ASSISTments and asked (1) how they used ASSISTments in their instruction; (2) how, if at all, using ASSISTments changed their teaching practices; (3) differences in their use of ASSISTments between in-person and remote instruction; and (4) their perceptions of homework and formative assessments, in general. (See Appendix C for the full interview protocol.) Interviews lasted between 14 minutes and 37 minutes. Participants were given gift cards for completing interviews.

Study Sample

In November of 2020—the second semester of remote learning for North Carolina’s teachers—the research team invited 544 ASSISTments users in North Carolina to take a Qualtrics survey to share their experiences teaching with ASSISTments both in-person and online. These teachers were identified from the ASSISTments registration list maintained by The ASSISTments Foundation (TAF). Users included those who began using ASSISTments prior to, during, and after the replication study took place. One hundred twenty-one teachers responded to the survey and 97 teachers completed it. Those who did not complete the survey were removed from the analysis.

Teachers were asked how long they had been teaching at their current schools, what grade levels they taught, the subjects they taught, during which years they had used ASSISTments, and in which conditions (i.e., in person or remotely) they used ASSISTments. Approximately half of the survey respondents had been teaching in their schools for three years or fewer. This is not unusual in North Carolina, where teacher turnover rates among middle-school math and English teachers have been historically high (Sorensen, L. & Ladd, H., 2019). All surveyed teachers indicated they used ASSISTments in mathematics classes. Although there were teachers who used it with first through eighth graders, most used it in seventh grade classrooms.

In reviewing the responses to the survey, researchers separated the teachers into three groups: those who used ASSISTments only during in-person instruction (n=4), those who used ASSISTments only during remote instruction (n=38), and those who used ASSISTments in both in-person and remote instruction (n=55). Researchers then determined which teachers from each of those groups to interview, based on their responses to the survey’s open-ended questions and the desire to have the largest group of interviewees be among those who used ASSISTments in both conditions. They asked the selected teachers to participate in interviews. Due to lower than desired response rates, the researchers eventually invited all the teachers who had completed the survey to participate in interviews. A total of 31 teachers were interviewed (n=18 both in-person and remote; n=12 remote only; n=1 in-person only).

Analysis

The study questions were the basis by which to analyze the data initially – to investigate how teachers implemented ASSISTments and how the instruction of teachers who implemented ASSISTments was impacted. The researchers also compared findings from this study to findings from previous results in the NC ASSISTments Replication Study.

Survey

Teachers were asked a series of questions in Qualtrics, with skip and display logic based on their responses to questions. Teachers were asked questions about how they used ASSISTments in their indicated settings (see Appendix B for the full survey). All responses regarding remote instruction were grouped together and analyzed, and all responses regarding in-person instruction were grouped together and analyzed. Responses from both groups were compared to see whether there were any differences in teachers’ use according to condition. Closed survey items were analyzed using descriptive statistics. Open-ended items were analyzed for themes using a mixture of *a priori* codes based on the study questions and open coding (Miles, et al, 2019).

Interviews

Interview audio recordings were transcribed using Rev.com, and researchers used Atlas.ti to analyze transcripts. Two researchers analyzed three transcripts together. A single researcher completed the analysis of the remaining 28 transcripts, sharing questions and findings regularly with the research team for supplemental analysis and feedback. The team used both inductive and deductive coding, establishing a set of codes based on the interview questions while also remaining open to using the data to formulate new appropriate codes (Saldana, 2021). To aid in analysis, researchers labeled responders based on the instructional conditions in which they had used ASSISTments – in-person only, remote only, and both remote and in-person.

Study Findings

1. How did teachers implement ASSISTments during the NC ASSISTments study, prior to COVID-19 and during COVID-19?

Key Findings

- **Teachers' use of ASSISTments did not significantly change from in-person to remote instruction.**

Teachers on the survey and in interviews indicated they used ASSISTments primarily for classwork and for homework, both in person and remotely. It was also used, less commonly, for assessment.

- **ASSISTments reports were used to complete steps 3 and 4 of the Four Steps of Independent Practice.**

The ASSISTments reports were used by teachers to identify which problems to review with students and to drive the class discussions regarding the problems reviewed together.

- **Technology issues and local instructional requirements were sometimes obstacles to ASSISTments use.**

Many teachers shared that their students had difficulties accessing ASSISTments due to technical limitations, such as a lack of digital devices or a lack of reliable internet access. This remained a problem in both in-person and remote instruction, even after many schools provided students with digital devices and hot spots.

Teachers' use of ASSISTments did not significantly change from in-person to remote instruction.

Our survey data indicated that teachers used ASSISTments in similar ways across teaching environments. Survey results showed that during in-person instruction, teachers used ASSISTments most frequently for classwork (77%) and homework (68%). They incorporated it to a lesser extent for assessment (45%) (Table 1). During remote instruction, the use looked almost identical to in-person instruction. Teachers used ASSISTments most frequently for classwork (75%), followed by homework (74%), and to a lesser extent, assessment (51%).

Table 1. How teachers used ASSISTments

Use	In-person instruction	Remote instruction
Classwork	77%* (n=43)	75%* (n=65)
Homework	68%* (n=38)	74%* (n=64)
Assessment	45%* (n=25)	51%* (n=44)

*Some teachers indicated multiple uses of ASSISTments, so these include duplicates.

The survey asked teachers how they used ASSISTments and then asked the purposes of the homework, classwork, and assessments they assigned using ASSISTments. They were given different purposes to choose from, depending on the use (i.e., homework, classwork, assessment). In both in-person and remote environments, teachers were less likely to use classwork and homework for formative assessment, opting instead to review new and old skills. However, among teachers who did use ASSISTments for assessment, teachers in both teaching environments indicated using it more

often for formative assessment (in-person 92%; remote 91%) rather than for summative assessment of specific skills (in-person 52%; remote 66%) and summative assessment of a chapter or unit (in-person 36%; remote 55%). Tables 2, 3, and 4 show the purposes of each way of using ASSISTments.

Table 2. Purposes of classwork use of ASSISTments

Classwork	Purpose of classwork in-person (n=44)	Purpose of classwork remotely (n=63)
Review old skills	93%*	85%*
Practice new skills	61%*	58%*
Formative assessment	50%*	62%*
Comprehension check	57%*	66%*

*Some teachers indicated multiple uses of ASSISTments, so these include duplicates

Table 3. Purposes of homework use of ASSISTments

Homework	Purpose of homework in-person (n=38)	Purpose of homework remotely (n=87)
Review old skills	82%*	52%*
Practice new skills	82%*	66%*
Formative assessment	55%*	41%*

*Some teachers indicated multiple uses of ASSISTments, so these include duplicates

Table 4. Purposes of assessment use of ASSISTments

Assessment	Purpose of assessment in-person (n=25)	Purpose of assessment remotely (n=44)
Formative assessment	92%*	91%*
Summative assessment of specific skills	52%*	66%*
Summative assessment of chapter or unit	36%*	55%*

*Some teachers indicated multiple uses of ASSISTments, so these include duplicates

Our follow up interviews supported these survey findings. Teachers shared that their use of ASSISTments had not changed much when they switched from an in-person environment to a remote one. When asked whether the change in instructional environments had influenced her use, one teacher said:

Not really, actually, because that's the main way I used them before. That's how I actually felt really good about starting off the year this year, knowing that ASSISTments was a tool I had and knowing that the students now had devices. So actually, that hasn't been very different.

ASSISTments reports were used to complete steps 3 and 4 of the Four Steps of Independent Practice.

The Four Steps of Independent Practice are an important part of ASSISTments and describe the process of using formative assessments to target instruction to students' needs. The four steps are: (1) teacher assigns content; (2) students engage with content; (3) teacher reviews results; and (4) teacher and students review results together. ASSISTments facilitates teachers' completion the four steps because it provides detailed information about how individual students performed and how classes performed on the assignment.

In general, teachers valued the ASSISTments reports and used them to plan and conduct homework or classwork reviews. Data in these reports supplied teachers with details about student performance, such as how much time individual students took to answer each problem and how many times they attempted the problem. At the class level, reports provided teachers with information on how many students answered each question correctly or incorrectly, showing the most common wrong answer for each problem. Interviews and survey responses indicated that teachers specifically used the reports to assess class performance and analyze answers together (steps three and four of the ASSISTments Four Steps of Independent Practice).

The majority (21) of teachers interviewed said they spent time examining the ASSISTments reports prior to reviewing the assignments with their students. For example, one teacher explained how reviewing the report guided her in meeting each of her students' needs:

Using that data [I] at least have something to support the things that I'm doing for either a small group, whole group, or individualized instruction. At least it provides me details on what should I do next. What are my next steps? Certain people have problems with this problem. I need to go back, try a graphic organizer, at least try a different online learning platform. It just gives me the opportunities to pull certain students into different directions. This student needs individual help. This student needs small group. This one, I can go, "Hey, this problem, I need the whole class. [It's] something I didn't teach right." So, it at least gives me an opportunity to show students, "Hey, I could have taught this better if I would've showed you the graphic organizer."

In general, teachers selected the most missed problems to review and discuss with their students. One teacher explained her problem selection process for review, sharing that she went over the most-missed problem every day:

And then what we do when they return the next day, I usually go through, and I'll look at the percentage for which ones they missed the most of. If I've got something that 98% of the students are getting, I'll leave that alone. But anything that has a lower percentage. And I always pick whatever's lowest, even if my lowest is 98, we're going over that in class. So, I usually pick the lowest ones that we have.

Using the reports to guide review was a consistent practice, as we also observed these routines during classroom observations and interviews during the 2017-2018 and 2018-2019 study years (Gillespie, June 29, 2020). Once they learned how to read the reports, teachers valued the student- and classroom-level data. While some teachers did note that they did not have time to conduct homework reviews during remote instruction, due to time constraints, report data could easily be incorporated into both in-person and remote teaching environments when they had the time.

Technology issues and local instructional requirements were sometimes obstacles to ASSISTments use.

The most frequently cited obstacles to using ASSISTments included (1) access to, and the reliability of, technology and (2) local district or school restrictions limiting use of the program. These barriers were present to some extent across teaching environments and were cited in the survey and during one-on-one interviews.

The survey asked, "What, if any, factors in your classroom or school made it harder for you to use ASSISTments during in-person instruction?" Of those who responded (n=32), nine wrote short answers regarding technology and internet issues. For example, teachers shared, "Not always having enough laptops in the past" or "If someone didn't have a

computer” as being implementation obstacles.

More teachers cited technology and internet issues as barriers to ASSISTments use during remote instruction, with 46 of the survey respondents noting related difficulties. Other obstacles to using ASSISTments during remote instruction that were mentioned on the survey could not be classified into any one category. Teachers cited misunderstandings about how to use technology effectively by students and families. For example, one teacher wrote, “None [of] it is very user friendly for teachers, parents, and students.” Another explained there were “some issues with uploading pictures to show work; [it] would be great to have an option to upload a google doc or other digital platform.” Teachers also mentioned the need for a read-aloud feature, difficulties integrating ASSISTments with Canvas, and difficulty training students how to use it.

These findings were supported during one-on-one interviews. For example, one teacher described the dearth of available technology in his school. As his school did not have a 1:1 student-to-technology ratio, he needed to reserve a class set of laptops ahead of time if he wanted to incorporate ASSISTments into his in-person instruction. Although technology, usually in the form of Chromebooks, did become more available as school districts took steps to make remote instruction possible during the pandemic, gaps remained. During an interview, one teacher explained that out of his more than one hundred students, only eleven had reliable computer and internet access. Due to this digital divide, he spent his time assigning paper and pencil homework, delivering assignments by bus while delivering food to his students daily.

A less frequent, yet notable, barrier to use was the specific school or district context. In the survey, some teachers documented how their districts restricted their use of ASSISTments and limited the amount of time they could teach synchronously during remote instruction. Several teachers reported being restricted to 30 minutes of synchronous teaching per class, which led them to eliminate the homework review. Certain districts or schools required teachers to use specific math programs to deliver content to their students, and ASSISTments was not on the list. On the survey, one person wrote, “The county did not support the use of ASSISTments.” A few teachers explained a similar set of contextual barriers during interviews, sharing how their school math teams did not support their use of ASSISTments. In one case, the team lead wanted everyone to be using the same resources in their classes. This made it difficult for teachers who otherwise would have used ASSISTments to incorporate it into their instruction.

2. How did ASSISTments affect teachers' instructional practices during the NC ASSISTments Replication Study, before COVID-19 and during COVID-19?

Key Findings

- **ASSISTments changed how teachers determined whether students understood lessons.**

The ASSISTments reports were used by teachers to determine the overall success of lessons and to home in on which parts of their lessons students had struggled with.

- **Teachers used the ASSISTments reports to adjust their instruction.**

Teachers reported using the ASSISTments reports to write or adjust their lesson plans, to respond to the ASSISTments reports with skill reviews and/or to create small groups for individualized instruction.

- **ASSISTments changed some teachers' attitudes toward homework.**

Some teachers shared that using ASSISTments had affected how they viewed and used homework in their instruction. They said that homework became more valuable to them because of the feedback provided to students and because the reports helped them plan follow-up instruction.

ASSISTments changed how teachers determined whether students understood lessons.

The survey asked teachers whether ASSISTments had changed how they determined whether students understood the lesson, and 73% said it had. Several teachers shared that they were giving formative assessments more frequently because of how easy it was to do this in ASSISTments. There were also a few teachers who said they were assigning homework more frequently with ASSISTments and many teachers who indicated that they were conducting focused homework reviews, or problem analysis, with their students thanks to the ASSISTments reports. Whether they knew it or not, they were doing formative assessment.

Because they could see quickly where misunderstandings occurred, they could address them the next day or sooner, and access to the reports gave teachers the ability to see how students were performing at both the individual and classroom levels. Teachers shared that with the help of ASSISTments, they chose questions to review in class that were more targeted to their students' needs. Before using ASSISTments, teachers were inconsistent in how they reviewed homework and understood their students' confusion. While some teachers waited for students to ask questions, others made strategic guesses as to what they thought were the toughest questions for students to answer. This affirms what was found in the classroom observations and interviews conducted in 2018-19 and in 2019-20.

The survey and interviews demonstrated that the use of ASSISTments as a formative assessment tool was common, even though not all teachers described it that way. Teachers were asked on the survey to define formative assessment and the results were quite varied, indicating a lack of universal understanding of the concept. Although many teachers did have similar and well-defined answers, such as "a way to monitor student learning and understanding in order to adjust my teaching to help students better learn and understand concepts," there were others who had very different conceptualizations. These included answers such as "County assigned check-ins using my county's assessment tool," or "Formative makes me think of a form which means on paper," or "quizzes (open book, plus retakes) and tests (closed book, usually on Schoolnet)."

During interviews, however, when teachers were asked if they used ASSISTments for things like exit tickets, they agreed that they did, explaining that they used exit tickets to adjust their instruction based on their students' understanding, with one teacher sharing she used the ASSISTments reports to "create reteaching groups," and another

saying, “The homework allowed me to see their strengths and weaknesses and form small group lessons.” Many teachers shared that ASSISTments was particularly helpful in determining whether their students understood lessons during remote instruction, when they could not circulate among the students to see their work, as they would have done in in-person instruction.

Teachers used the ASSISTments reports to adjust their instruction.

The survey asked teachers whether ASSISTments changed how they reviewed homework, and 56% of teachers said yes. Interviews and survey results revealed that the ASSISTments reports altered teachers’ instructional practices in several ways. Most of the teachers who said ASSISTments changed how they reviewed homework said that they used the reports to identify problems to review with the class. Teachers shared that their homework reviews became more focused on the problems students struggled with the most. One teacher, describing her remote instruction, shared, “When I use ASSISTments, I review homework the next day. Without it, I tend to post answers for students instead.” She found it easier to adjust her instruction and use homework as a formative assessment when using ASSISTments. When she did not use ASSISTments, the students were simply told what the correct answers were and there was no class discussion of the assignment.

Another teacher said that her homework reviews when she uses ASSISTments in person had become more focused and she was saving time when she used ASSISTments in person with them.

The immediate feedback is helpful in driving my instruction. I wouldn’t spend a ton of time reviewing homework, would use the reports to determine what misconceptions there were and clarify the next class versus reviewing all the problems.

Other teachers shared how they used the reports not only to drive skills reviews, but also to encourage students.

I love using the data report with the class to review how students did. I love celebrating the questions they all answered [correctly] and using the information to drive what I review next that they still need practice with.

I can do problem analysis with the entire class, hide names and discuss common errors, influence students to participate.

The survey results also showed that, based on the reports, most teachers adjusted their instruction, in a number of ways. They modified their homework reviews, created small groups for instruction, included more comprehension checks, or altered other activities during the lesson. One teacher shared, “It allowed for much faster data turnaround; therefore, it made it easier to make quick adjustments in instruction.” Teachers said using the reports to determine what to reteach was key in their ASSISTments use. One teacher described using the individual student reports to guide her one-on-one conversations with students during office hours. A few teachers shared that they used the reports to group students.

[They help me] differentiate my small group instruction, based on areas of strength and weakness according to ASSISTments reports.

This finding was supported through our interviews, in which about a third of all interviewed teachers (10) indicated that the reports aided them in creating small groups for more personalized instruction.

There were a few teachers who reported that ASSISTments helped them conduct quicker homework reviews or to adjust instruction more quickly. They said that the homework review went more quickly because of ASSISTments, which was especially helpful during remote instruction, but also during in-person instruction. As one teacher shared, “The review goes so much faster. I choose the problems missed most to reteach, or I can pull one student or a small group depending on results. So efficient!”

With ASSISTments, teachers looked at the reports and chose the most frequently missed questions for review in class. They also used the reports during the homework review, to spark the class discussions. One teacher shared:

It was easier to do the exit ticket as their warmup [the next day], and do a couple of questions in ASSISTments,

and then right there pull up the data and take out the names, and look at the data and see, "What trends do we notice, what patterns do we see? It looks like a lot of people are getting number three wrong. Why are we getting this wrong?" It targeted a little bit more of a discussion based on their data, which was helpful. To see, "Oh look, a lot of people are making the same mistake. Let's pull that out." That was probably our primary tool, was to use it and then immediately go over the data with them from that.

Some teachers used ASSISTments reports to form small instructional groups for targeted support. There were also instances where teachers had effectively taught their students to interpret the reports, which built a strong formative assessment culture within the classroom. Students were encouraged to have conversations about math together, forcing them to explain their answers with one another.

Well, what ASSISTments changed is the students being able to analyze others' work, their own work, without having to be criticized or anything like that, constructive criticism and seeing mistakes and things like that, cause that's one of the biggest issues. They will avoid doing a problem just for the sake of not being wrong.

ASSISTments became a part of the daily routine for some teachers during remote teaching. One teacher shared that she used it as a way to mark attendance:

I do use it daily. For my purpose, it's also attendance. That's not what ASSISTments wants it to be, but since I'm remote or virtual, the kids always know there are five starter or warm up questions there for them to do every day. And if they want proof that they are doing that. Now, will they do my actual math assignment on Pythagorean theorem? Not necessarily, but they will pretty religiously answer those five warm up questions or starter or whatever I have on ASSISTments. They will click on that link and go and answer those questions.

Some teachers' attitudes toward homework were changed after using ASSISTments; however, attitudes toward homework during remote instruction were complicated.

The survey asked teachers if using ASSISTments had affected how they reviewed homework and if it had affected the way they used homework. Fifty-six percent of respondents said that ASSISTments had affected how they review homework with their students. The majority of these teachers said that they identified the problems they wanted to review with their students based on the ASSISTments reports. Many teachers indicated they did problem analysis of the identified problems with the whole class and some said they put students into small groups for that purpose.

In interviews, a few teachers also said that they found homework to be more valuable with ASSISTments because of the data it provided and how quickly that data was provided. One teacher, in describing how she reviewed homework with her students prior to using ASSISTments, shared that it was often done several days after the assignment was completed. This changed when she started using ASSISTments.

Giving the feedback after a week, they are like, 'When did we do this? I do not remember this. What is this?' Now, I am giving them the assignment tonight. Tomorrow morning when they come in with a check-in, it is the first thing we are looking at.

The shift to remote instruction had a great impact on teachers' use of homework. Some teachers described ASSISTments as essential to their remote teaching because of the reports and because they could have their students upload pictures of their work. Some teachers shared that the automated grading in ASSISTments made it easier for them to assign homework or give formative assessments more frequently. One teacher said, "It helps me manage my workload." Prior to using ASSISTments, they graded formative assessments by hand and they did not typically complete the item-level analysis that is provided by the ASSISTments reports.

Many teachers shared that homework didn't exist in remote teaching. Several teachers said that all the assignments were homework during remote instruction, or that they no longer assigned homework during remote instruction. Many of them mentioned the need to be responsive to the stresses students and their families were feeling while they were learning from home, and to lessen the workload. One teacher shared that she used ASSISTments during remote instruction for assessment at the end of a unit while teaching remotely; however, she thought once she returned to in-

person teaching, she would use ASSISTments for homework again because she liked having the reports to drive the homework review.

Conclusion

In this case study of teachers' use of ASSISTments before and during the pandemic, the PEER Group at the Friday Institute found that teachers used ASSISTments more for classwork than for homework in both conditions, and that teachers used the ASSISTments reports to review students' results and to conduct problem reviews with their students. The study also found that teachers' instructional practices changed most in how they determined whether their students understood lessons, and in how they conducted homework reviews. The case study also found that some teachers adjusted their instruction in different ways when using ASSISTments, such as using it to create small groups or using the reports to facilitate the development of a formative assessment culture in their classes. These findings support the ASSISTments Theory of Change (Figure 1) in that the "diagnostic reporting to teachers" led to "more targeted homework review and increased instructional adaptation."

The study also found that teachers had varying levels of understanding of formative assessments, and that the term itself, 'formative assessment,' could have been an obstacle to universal understanding of the concept. In interviews, teachers identified practices they did regularly that amount to formative assessment, although they did not always use that term. Whatever terms they used, teachers were using ASSISTments to determine their students' levels of understanding and to adjust their instruction.

Also of interest is the finding that teachers generally used ASSISTments in the same ways in both in-person and remote instruction. With a few exceptions, teachers used ASSISTments for classwork or homework in both conditions. This finding indicates that ASSISTments has the potential to support teachers and students in various learning environments. Some teachers expressed the desire to see some changes or improvements to ASSISTments, saying that they would have used ASSISTments more often if it had provided specific things they were looking for. This presents an opportunity for ASSISTments to provide even stronger support for teachers and students across instructional environments. The following section presents recommendations for ASSISTments moving forward.

Recommendations

The following recommendations are based on analysis of all the data collected as part of the case study. Some of the recommendations come from ASSISTments users that came directly from the study's data collection. Other recommendations are based on the study's findings and are more holistic. They all aim to improve ASSISTments.

Design a drawing tool. ASSISTments users would value an in-program drawing tool. Some ASSISTments problems require students to upload pictures of their work, which can lead to difficulties for users. Some students and parents had difficulty using the upload tool, and teachers were sometimes unable to explain how to do it when teaching remotely. This contributed to teachers using other programs, such as Nearpod, which offered them more options and flexibility.

Ensure ASSISTments has a uniform appearance across devices. A small number of users noted that they faced difficulties assisting their students remotely because the program looked different across device types. This made using ASSISTments difficult in a remote environment, especially when teachers tried helping parents and students who struggled with the program. Teachers realized that what they saw on their screen was not the same as what was on their student's screen. As consistency of platform appearance across all device types would benefit ASSISTments users, ASSISTments may want to consider developing an app that students and parents could access easily.

Continue to solicit feedback from users in a variety of ways. During data collection for this study, researchers heard from teachers about things they'd like to see added to ASSISTments and ways that ASSISTments at times was difficult for them to use. ASSISTments should continue to regularly ask users for their feedback about the platform. This practice has already led to improvements in the platform, helping drive the third iteration (Fresh New Look). It would be beneficial to ASSISTments to have a users group to consult regularly, whether through surveys, interviews, or group discussions. If ASSISTments can regularly hear from teachers using ASSISTments with their students, the platform will be able to respond to issues, provide the features teachers need, and remain a useful tool.

Address varied understandings of formative assessments. Survey results and interview findings revealed that teachers have vastly different conceptions of and definitions for formative assessments. We recommend that ASSISTments address these various understandings so that teachers are using a common language, which could lead to less confusion. ASSISTments could address this issue by producing and featuring introductory video tutorial explanations of formative assessment on the ASSISTments website. ASSISTments may also consider creating a short professional development module to help teachers understand what formative assessments are and the many ways they can be used.

Investigate further teachers' uses of ASSISTments in both remote and in-person instruction. Teachers shared, via the survey and interviews, that they used ASSISTments in the same ways whether they were teaching in person or remotely. This presents an opportunity to dive deeper into the uses of ASSISTments in both contexts, and to learn whether this finding could be replicated in other locations and conditions. This finding indicates ASSISTments has the potential to support teachers and students in multiple learning environments and to become an important tool for instruction, whether in person or remotely.

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Appendix A – Study Questions

SQ1. Implementation: *How did teachers implement ASSISTments during the NC ASSISTments study, prior to COVID-19 and with COVID-19?*

- a. How, and for what purposes, did teachers use ASSISTments with homework and/or classwork?
- b. How, if at all, did teachers use the Four Steps of Independent Practice?
- c. What elements in the teachers' working environments supported or hindered their use of ASSISTments?
- d. Among teachers who used ASSISTments for in-school learning and remote learning, how did the purpose, pattern, and ways of using it change in remote learning?
- e. Among teachers who only used ASSISTments for in-school learning, what factors contributed to their decision not to use ASSISTments in remote learning?

SQ2. Impact: *How did ASSISTments affect teachers' instructional practices during the NC ASSISTments study, before COVID-19 and with COVID-19?*

- a. How, if at all, did teachers' perceptions of homework change as a result of using ASSISTments?
- b. How, if at all, did teachers' use of homework as formative assessment, and use of formative assessments, change as a result of using ASSISTments?
- c. How, if at all, did teachers' instructional decision-making change as a result of using ASSISTments?

Appendix B – Survey

ASSISTments User Survey - Fall 2020

Start of Block: Intro & Consent

Thank you for taking this survey. The purpose of the survey is to help us understand how teachers use ASSISTments and how, if at all, it might influence teachers' overall instructional practices. The survey should take 10-15 minutes to complete.

I have read and understand the above information. My decision to participate is as follows:

- Yes, I agree to participate. (1)
- No, I do not wish to participate. (2)

Skip To: End of Survey If I have read and understand the above information. My decision to participate is as follows: = No, I do not wish to participate.

End of Block: Intro & Consent

Start of Block: Demographics

First name

Last name

Would you like to receive a \$25.00 Amazon e-gift card as a thank you for completing this survey? If so, we will need to collect your email address (to send the e-gift card) and mailing address (accounting verification).

Yes (1)

No (2)

Display This Question:

If Would you like to receive a \$25.00 Amazon e-gift card as a thank you for completing this survey?... = Yes

Email address (This information is needed to send you a \$25.00 thank you gift card for completing the survey.)

Display This Question:

If Would you like to receive a \$25.00 Amazon e-gift card as a thank you for completing this survey?... = Yes

Mailing address (This information is needed to send you a \$25.00 thank you gift card for completing the survey.)

Page Break

What district do you teach in?

What school do you teach in?

How long have you been teaching in this school?

- Less than a year (4)
- 1-3 years (5)
- 4-6 years (6)
- 7-10 years (7)
- More than 10 years (8)

Page Break

In what years have you used ASSISTments? Check all that apply.

- 2017-18 (1)
- 2018-19 (2)
- 2019-20 (3)
- 2020-21 (4)

In teaching which grade level(s) have you used ASSISTments? Check all that apply.

- 5th (1)
 - 6th (2)
 - 7th (3)
 - 8th (4)
 - 9th (5)
 - 10th (6)
 - 11th (7)
 - 12th (8)
 - Other (please explain) (9) _____
-

In teaching which subject(s) have you used ASSISTments? Check all that apply.

- Mathematics (1)
 - Science (2)
 - Social Studies (3)
 - Language Arts (4)
 - Other (please explain) (5) _____
-

Are you currently, or do you plan on, using ASSISTments during the 2020-2021 school year?

Yes (1)

No (2)

End of Block: Demographics

Start of Block: Implementation

In what instructional environments have you used ASSISTments?

In-person only (1)

Remote only (2)

Both in-person and remote (5)

Skip To: End of Block If In what instructional environments have you used ASSISTments? = Remote only

Display This Question:

If In what instructional environments have you used ASSISTments? = Both in-person and remote

Does the purpose or the way you use ASSISTments differ depending on whether you use it with in-person instruction or remote instruction? Please explain.

Page Break _____

Think about how you have used ASSISTments in your in-person instruction. Please answer the following questions.

Page Break _____

How have you used ASSISTments with your students during in-person instruction? Check all that apply.

- Homework (1)
- Classwork (2)
- Assessment (3)
- Other (6) _____

Display This Question:

If How have you used ASSISTments with your students during in-person instruction? Check all that apply. = Homework

What were the purposes of the ASSISTments homework assignments? Check all that apply.

- Practice new skills (1)
- Review old skills (2)
- Formative assessment (3)
- Other (please explain) (4) _____

Display This Question:

If How have you used ASSISTments with your students during in-person instruction? Check all that apply. = Classwork

What were the purposes of the ASSISTments classwork assignments? Check all that apply.

- Comprehension check (1)
- Practice new skills (2)
- Review old skills (3)
- Formative assessment (4)
- Other (please explain) (5) _____

Display This Question:

If How have you used ASSISTments with your students during in-person instruction? Check all that apply. = Assessment

What were the purposes of the ASSISTments assessments? Check all that apply.

- Formative assessment of specific skills (1)
- Summative assessment of specific skills (2)
- Summative assessment of chapter or unit (3)
- Other (please explain) (4) _____

Page Break

What, if any, factors in your classroom or school **made it easier** for you to use ASSISTments during in-person instruction?
Please describe.

What, if any, factors in your classroom or school **made it harder** for you to use ASSISTments during in-person instruction?
Please describe.

End of Block: Implementation

Start of Block: Remote learning

Have you spent any time, this year or last year, in a remote teaching and learning environment?

Yes (1)

No (2)

Skip To: End of Block If Have you spent any time, this year or last year, in a remote teaching and learning environment? = No

Have you used ASSISTments with your students during remote learning?

Yes (1)

No (2)

Skip To: noremoteASS If Have you used ASSISTments with your students during remote learning? = No

Think about the times that you have used ASSISTments with your students during remote instruction.

How have you used ASSISTments during remote learning? Check all that apply.

- Homework (1)
- Classwork (2)
- Assessment (3)
- Other (6) _____

Display This Question:

If How have you used ASSISTments during remote learning? Check all that apply. = Homework

What were the purposes of the ASSISTments remote homework assignments? Check all that apply.

- Practice new skills (1)
- Practice old skills (2)
- Formative assessment (3)
- Other (please explain) (4) _____

Display This Question:

If How have you used ASSISTments during remote learning? Check all that apply. = Classwork

What were the purposes of the ASSISTments remote classwork assignments? Check all that apply.

- Comprehension check (1)
- Practice new skills (2)
- Practice old skills (3)
- Formative assessment (4)
- Other (please explain) (5) _____

Display This Question:

If How have you used ASSISTments during remote learning? Check all that apply. = Assessment

What were the purposes of the ASSISTments remote assessments? Check all that apply.

- Formative assessment of specific skills (1)
- Summative assessment of specific skills (2)
- Summative assessment of chapter or unit (3)
- Other (please explain) (4) _____

Display This Question:

If Have you used ASSISTments with your students during remote learning? = No

Why haven't you used ASSISTments with remote learning?

What, if any, factors in your classroom or school made it easier for you to use ASSISTments during remote instruction? Please describe.

What, if any, factors in your classroom or school made it harder for you to use ASSISTments during remote instruction? Please describe.

End of Block: Remote learning

Start of Block: Changes-homework

Now we'd like to ask some questions about how, if at all, using ASSISTments influenced your use of homework in your instruction more broadly. **These questions pertain to assigning homework using a digital tool or any other way.**

There are no right or wrong answers. The best answers are those that are true for you.

Did your experience using ASSISTments influence how frequently you assign homework more broadly? Please explain.

Did your experience using ASSISTments influence if or how you review homework in class? Please explain.

Did your experience using ASSISTments influence the way you use homework as part of your larger instructional plan? Please explain.

End of Block: Changes-homework

Start of Block: Changes-other instruction

Now we'd like to ask you some questions about formative assessments and about how, if at all, your experience using ASSISTments may have influenced other aspects of your instruction.

There are no right or wrong answers. The best answers are those that are true for you.

Page Break

How do you define formative assessment in your own mind?

Did your experience using ASSISTments influence how you determine whether students understand the lesson more broadly, whether in face-to-face or remote instruction? Please explain.

Page Break

Did your experience using ASSISTments influence how frequently you use formative assessments more broadly, whether in face-to-face or remote instruction? Please explain.

Did your experience using ASSISTments influence how you use the information you gain from formative assessments more broadly, whether in face-to-face or remote instruction? Please explain.

End of Block: Changes-other Instruction

Appendix C – Interview Protocol

Introduction

Thank you for taking the time out of your schedule to be here today. We value your effort and promise not to go over the allotted time. My name is (XXX) and I work for North Carolina State University. We are partnering with WestEd, Worcester Polytechnic Institute, and SRI to gather feedback from ASSISTments users. We want to understand how you have used ASSISTments, if there were things that made it harder or easier for you to use ASSISTments, and if ASSISTments has affected your instruction.

Before we begin, I'd like to go over a few disclosures:

- Your participation in this focus group is voluntary. It is your decision to participate in this study, to not participate, or to stop participating at any time.
- The session will be digitally recorded in order to have a complete record of our discussion. The discussion will be kept completely confidential; any information obtained from you that can identify you will be disclosed only with your permission. We will use code numbers in the management and analysis of the focus group/interview data and your name will not be associated with any discussion results.
- Today's discussion will be loosely structured and informal. You may ask clarifying questions any time.
- I expect our discussion to last about 30 minutes.

RECORD VIA ZOOM. STATE AT BEGINNING OF RECORDING: THIS IS (YOUR NAME), INTERVIEWING (INTERVIEWEE'S NAMES/ROLES) FOR THE ASSISTMENTS CASE STUDY.

Questions

- How are you teaching now? Remote? Face-to-face? Both?
- Are you currently using ASSISTments?
- Retrospective ASSISTments use
 - Prior to using ASSISTments, what did you think about homework?
 - [Probe] What was your approach to homework?
 - [Probe] What did you use it for?
 - [Probe] How valuable was it to your teaching?
 - Prior to using ASSISTments, how did you assign homework/classwork?
 - Prior to using ASSISTments, how often did you give formative assessments?
 - [Probe] What forms did they take?
 - Prior to using ASSISTments, what did you do with the results from those formative assessments?
 - Prior to ASSISTments, how did you plan for lessons?
 - [If applicable] Why did you decide not to use ASSISTments with remote instruction?
 - [Probe] Were there things in your remote teaching environment that made it difficult to use ASSISTments?
 - Was there anything in your teaching environment, either face-to-face or remote, that made it easier to use ASSISTments?
 - Was there anything that made it harder to use ASSISTments, in either face-to-face or remote instruction?
- Current ASSISTments use
 - How do you use homework now?

- [Probe] Are there differences in your use of homework between your face-to-face lessons and your remote lessons?
- How do you use ASSISTments?
 - [Probe] For homework/For classwork/For intervention/For assessment?
 - [Probe] Are there differences in how you use ASSISTments between your face-to-face lessons and your remote lessons?
- How often do you use ASSISTments?
 - [Probe] Are there differences in how often you use ASSISTments between your face-to-face lessons and your remote lessons?
- How do you use the reports?
 - [Probe] What do you use them for?
- How often do you assign homework?
 - [Probe] Is this the same for face-to-face and remote lessons?
- How valuable is homework to your instruction now?
 - [Probe] Has this changed since using ASSISTments?
 - [Probe] Is this the same for face-to-face and remote lessons?
- How do you review homework/classwork assignments?
 - [Probe] Do students participate?
 - [Probe] Are there differences between your face-to-face lessons and your remote lessons?
- How do you select problems to review during homework/classwork review?
 - [Probe] Is it the same for remote and face-to-face?
- How often do you use formative assessments?
- How do you know when students have understood?
 - [Probe] During a lesson?
 - [Probe] After a lesson?
 - [Probe] Has this changed at all since using ASSISTments?
- What do you do when students have not understood?
 - [Probe] During a lesson?
 - [Probe] After a lesson?
- How do you plan for lessons now?
 - [Probe] Are there differences between how you plan for face-to-face lessons and for remote lessons?
 - [Probe] Has this changed at all since using ASSISTments?
- How often do you adjust your lessons in real time?
 - [Probe] Is it the same for face-to-face and remote lessons?
- Where does ASSISTments fit into your teaching toolkit?