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Use of personalized learning platforms in one pandemic-era microschool: A case study

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Introduction

The onset of the Covid-19 pandemic has disrupted the education of every child in the nation. Early in the pandemic, school districts scrambled to determine how to best educate students. Now, two years later, educators continue working to address interrupted student learning, increased disparities in opportunities to learn, and widespread student mental health concerns.

Personalized learning platforms—which are online or virtual curricula that differentiate instruction so that the level of challenge of the content is tailored (or "personalized") to the skill level of the child—have played a role as one way to address these concerns throughout the pandemic. Personalized learning platforms were employed in remote learning by district-run schools and in nontraditional settings such as microschools and learning pods to instruct students while school buildings were closed. Districts have used them to continue to offer virtual learning options, and teachers use them to accelerate or provide remedial support, as well as for ongoing instruction.

The proliferation of settings in which personalized learning platforms have been used during the pandemic offers rich opportunities for describing those use cases and understanding how such platforms might affect students' academic, social, and emotional outcomes. We know relatively little about which use cases provide the best outcomes for students. In this report, we discuss one example of how personalized learning platforms were used in the first year of implementation in an innovative learning environment: the Southern Nevada Urban Micro Academy (SNUMA).

The SNUMA use case is intriguing because leaders set ambitious goals for students whose learning was assessed as being below grade level. These goals encouraged extensive use of personalized learning platforms—usage that, to the best of our

knowledge, exceeded developer recommendations. The platform metrics we were able to examine suggest that most students made substantial progress and were assessed as performing at grade level by the end of the school year. However, these results also raise many questions. We do not know, for example, if these gains will be validated by standardized assessments or if they were achieved at the expense of students' social and emotional well-being.

Key Findings

- In its first implementation, SNUMA relied on a hybrid educational model that heavily leveraged personalized learning platforms in addition to in-person instruction to support students' academic progress. SNUMA leaders set ambitious goals to help students access grade level content and thus students' online platform usage exceeded developer recommendations.
- Based on the personalized learning platform metrics, most SNUMA students that started below grade level made substantial progress toward accessing grade level by the end of the year, as measured by the platforms.
- These descriptive results are encouraging but difficult to interpret because we do not know if the amount of time spent on the platforms was more or less effective for student learning than other educational approaches. We also do not know what activities students might have missed while using the platforms, or how the instructional approach SNUMA took in its first year influenced non-academic student outcomes.
- A future research agenda could aim to identify optimal use cases for personalized learning platforms that balance students' need for a variety of instructional strategies with socialization and academic learning. Future studies should examine equity of use, implementation, and student outcomes on standardized assessments, particularly if personalized learning platforms are used to address interrupted learning.

In this brief report, we summarize student usage data from the personalized learning platforms used in SNUMA in its first year of implementation and discuss the limitations of our analysis. We conclude by suggesting directions for future research that could enhance our understanding about how such platforms are used—and how they influence student outcomes—in nontraditional settings.

SNUMA's use of personalized learning platforms

K–12 public schools swiftly closed in March 2020, and as weeks of school closures dragged into months, parents became concerned about their children's academic progress and social and emotional well-being while many parents had to return to work. In this context, some stakeholders—including parents, educators, and community-based organizations—sought ways to safely educate smaller groups of students in person. One incarnation of this approach was the establishment of microschools, which enrolled small numbers of students and hired staff to educate them in facilities throughout the community. Though microschools existed before the Covid-19 pandemic, the health crisis may have accelerated their adoption (Horn 2021).

The Center on Reinventing Public Education (CRPE) profiled the first year of implementation—the 2020–21 school year—at one microschool established during the early months of the pandemic in Clark County, Nevada, called SNUMA (Gilliam and Barrett 2022). As the authors of that profile describe, children who attend SNUMA leave the local public school system to enroll in the program as homeschoolers. The city of Las Vegas provided facilities to host the instructors and students and provided funding, IT infrastructure, and computers.[1]

In 2020–21, SNUMA classrooms were staffed by interventionists and instructors called "learning guides," who often had prior experience in education. SNUMA started with 50 students in the fall of the 2020–21 school year and grew to serve close to 100 students by the end of the school year. At first, two sites in the city housed the students, with a third added in the second semester to accommodate the growing enrollment. In general, SNUMA's instruction occurred in same-age groups.

Like many public schools, in its first year of implementation SNUMA employed personalized learning platforms as part of instruction. At SNUMA, personalized learning platforms were used for independent practice and one-to-one or small-group sessions with instructors (Gilliam and Barrett 2022). At the time, educational technologies of all types were becoming increasingly common in schools (Escueta et al. 2017), but the pandemic saw the mass adoption of such tools to facilitate remote learning and mitigate learning loss caused by the pandemic (Singer 2021; Lieberman 2020).

The personalized learning platforms used by SNUMA take a variety of approaches to presenting academic content. Lexia and Dreambox differentiate math and/or literacy instruction so that the difficulty of the academic material is tailored to the skill level of the child. Although teachers can manually select lessons for each student if they wish, many of these systems are designed to work automatically, relieving the teacher of that workload. They prompt new users to take a diagnostic assessment within the platform to determine an appropriate starting point for each student within the content offered by the platform and adapt the content presented based on how the child performs, often providing remedial content if basic skills are not mastered, while also ensuring students access grade-level content. In theory, this differentiated instruction matches the difficulty of the academic material to the skill level of the child.

Zearn Math takes a slightly different approach and does not begin with a diagnostic assessment. Instead, all children start with grade-level content and are provided with remediation on prerequisite skills, if needed. For students who are too far behind for the platform to support them solely through remediation, the program notifies teachers, who may choose to assign below-grade-level lessons. Children who have mastered grade-level content can access higher-level math instruction on the platform. In theory, though, all platforms aim to provide students with instruction

1 The 2020-2021 school year, which was the first year of implementation of SNUMA, the nonprofit Nevada Action for School Options was the technical partner responsible for developing and implementing the teaching and learning model. Nevada Action for School Options staff donated their time, while city funding was used for program expenses, such as paying Learning Guides and Interventionists. By prior arrangement, Nevada Action for School Options did not operate SNUMA after the first year of implementation. Thus, starting in the 2021-2022 school year, SNUMA was operated by a different organization selected by the city of Las Vegas. According to Nevada Action for School Choice staff, this new partner made changes to the SNUMA learning model and did not employ the same personalized learning platforms used in 2020-2021.

that is tailored to their skill level so that students behind grade level can catch up and students on or above grade level continue to make progress.

In traditional K–12 public schools, teachers may use personalized learning platforms in different ways, but in general such platforms are one element of class instruction, used in combination with whole-class instruction and small-group instruction to supplement the curriculum. Although platform developers often recommend optimal use cases and an amount of time students should engage with the platform based on the use case, teachers have wide latitude over instruction in their classrooms and thus can use the platforms in a variety of ways. The increasing popularity of personalized learning platforms, coupled with the agency that districts and teachers have in choosing and employing platforms, suggests that students are likely to use several different platforms during a school year or throughout the school day.

In this report, we build on CRPE's research on SNUMA and leverage this context as a case study to more deeply understand the role personalized learning platforms played in SNUMA's instructional approach and the types of data available across platforms. In addition to understanding how SNUMA instructors deployed the platforms in a unique educational context during the pandemic, we analyze the platform data to explore how they could be used in a research context to understand student academic progress and learning.

An analysis of this use case is instructive because as personalized learning platforms continue to become more embedded in K–12 classrooms during pandemic and beyond, it is likely that use of these technologies will continue to grow and become more varied. Yet we know relatively little about which use cases provide the best outcomes for students. This case study not only illuminates the application of these technologies in a unique context, but it also highlights the current limitations of platform data as well as the promise they hold to provide a more standardized and holistic picture of student progress.

Data

As Gilliam and Barrett (2022) describe in their case study, the SNUMA model included whole-group instruction and adaptive learning through personalized learning platforms in which students were coached one to one or in small groups with interventionists. Prenda provided curriculum for grades 1 and 2 in math and English language arts (ELA). Prenda included Zearn Math for math instruction and Lexia for literacy instruction. Cadence Learning provided curriculum for grades 3–8 and employed Lexia for literacy and Dreambox for math. Lexia Core5 was used for students in grades 1–5, and Lexia PowerUp was used in grades 6–8. Some students in grades 3 and 5 also used PowerUp. Gilliam and Barrett (2022) provide a more complete description of the SNUMA model based on interviews with staff and parents.

RAND worked with SNUMA, Prenda, and Cadence Learning to obtain data on student platform use on each of the personalized learning platforms in use at SNUMA during the 2020–21 school year, which began in August and ended in June. The data available differed across platforms; Table A1 in the appendix lists the data variables we obtained for each platform. Most of the variables centered around student usage

of the program and progress through the material, as defined by each platform. Lexia and Dreambox usage data consisted of the number of minutes the software was used at a weekly or daily granularity. In addition to actual usage, Lexia provided target usage, or the number of minutes per day that a child was recommended to use the platform based on the child's knowledge and progress. Zearn did not provide usage data.

Progress indicators included the number of activities, units, and lessons completed on a weekly or daily basis. Definitions of an activity, lesson, or unit were unique to the platform and were not comparable across platforms. Finally, each platform provided some summative measures of student progress, as defined by the program. Lexia provided beginning- and end-of-year assessments of whether the student was below, at, or above grade level, while Dreambox provided only a beginning-of-year assessment of student grade level (below, at, or above). Additionally, Dreambox provided the number of standards (as defined by the program) in which the student achieved proficiency and the number of standards in which they showed progress.

Zearn provided the number of badges earned; badges are connected to mastery of math content and the grade level of each lesson completed. We used the information about lesson grade level to impute starting and end-of-year grade-level assignments. At the beginning of the year, a child was marked below grade level if they were assigned below-grade-level lessons by the teacher.[2] At the end of the year, a child was marked above grade level if they were completing above-grade-level lessons.

In addition, SNUMA provided the race/ethnicity, gender, and age of each student who appeared in the platform data. We also conducted telephone interviews with two SNUMA educators—one learning guide and one interventionist—in December 2021. These interviews focused on understanding the general context in which educators used the SNUMA online learning platforms during the 2020–21 school year to help us interpret the student usage data but were not intended to gather general information about SNUMA's instructional model. For example, interview questions focused on which online platforms educators used, whether and how educators used platform data or diagnostic assessments to inform their instruction, what other instructional materials (if any) educators used to supplement the online platforms, how frequently students used the platforms, and the role the platforms played in instruction (e.g., whether they were the primary vehicle for instruction or a supplement to other materials). We refer readers to the CRPE case study (Gilliam and Barrett 2022) for a detailed description of the SNUMA learning model.

Table A2 in the appendix shows the characteristics of the students in the analysis. We had demographic and online platform data for 76 students who were enrolled at SNUMA during the 2020–21 school year or about three-quarters of all students enrolled in SNUMA during that year (Gilliam and Barrett 2022). The sample had a diverse representation of races and ethnicities. Of the students in our sample, 32 percent identified as Black, 25 percent as Hispanic, and 39 percent as White. More students were in the lower grades, with 10 to 18 students per grade in grades 1–5. Few students were present in higher grades, with three to five students per grade in grades 6–8.

2 Zearn does not use a diagnostic assessment and begins with grade-level content, supplemented with practice on prerequisite skills, if needed. If the supplemental practice is not enough for the student to access grade-level content, teachers are alerted and may choose to assign below-grade-level lessons.

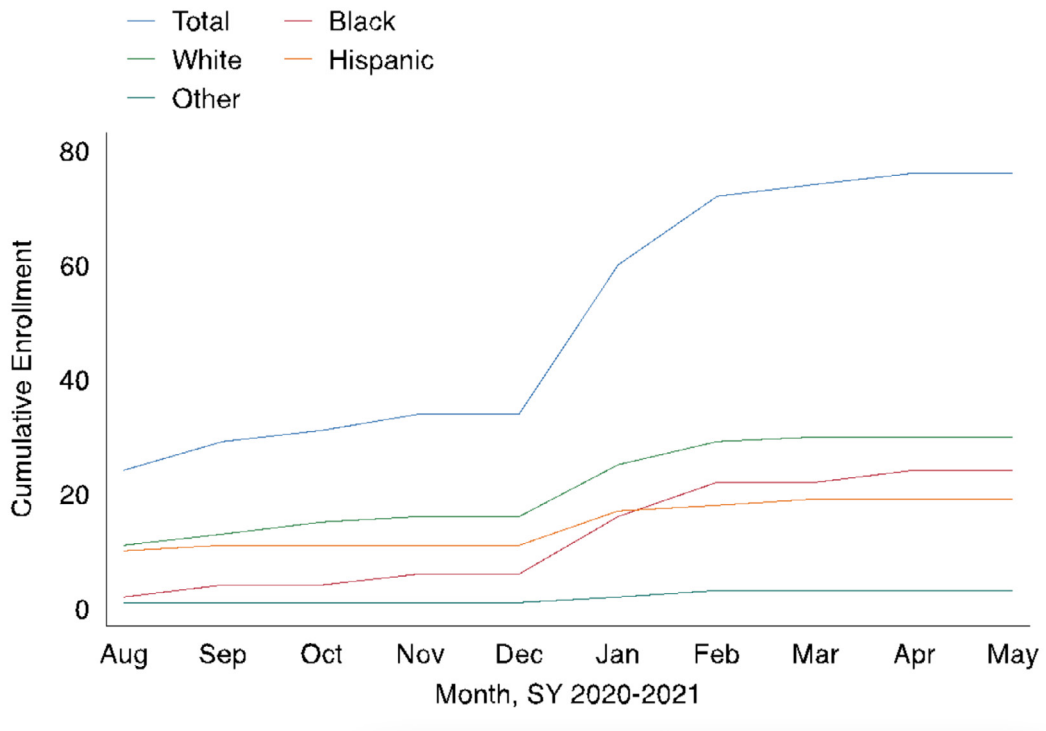
Analysis

We generated descriptive statistics to explore the extent to which SNUMA students used each online platform and, when possible, how actual use compared to the amount of use recommended by the platform. We computed weekly hours of platform use because this was the smallest unit of time for which use data were available for both platforms that provided such information.

Figure 1 shows the enrollment of the SNUMA students in our sample as the 2020–21 school year progressed. In September, there were 24 students. That number increased to 34 students by the end of the semester in December. A substantial number of new students entered in January, increasing the sample to 60. By the end of the school year, the sample had reached 76 students.

To ensure that platform use metrics were comparable despite the staggered nature of student enrollment, we normalized usage by calendar time enrolled in SNUMA. We also explored relationships between student background characteristics (i.e., race/ethnicity, gender, and age), and platform metrics such as normalized usage and the starting and ending grade levels estimated by the platforms. Our aim was to understand whether platform use was especially beneficial for students with certain background characteristics or students who used the platforms for greater amounts of time. To investigate these relationships, we employed linear regression to test whether the set of student background characteristics were related to outcomes of interest such as total minutes spent on platforms; activities, lessons, units, or badges completed; or the ending grade level as estimated by the platform. We also explored whether enrollment patterns (which we measured as the number of weeks students used the platforms) and starting grade level varied by student race and ethnicity, gender, and grade. These analyses were intended to reveal any differential starting levels by observable characteristics. We used interview reports from the two educators as general background to help us interpret the results of these analyses.

Figure 1. Enrollment in SNUMA over time, total and by race and ethnicity



Results

SNUMA leaders set ambitious goals to help students access grade-level content; thus, students' online platform usage exceeded developer recommendations

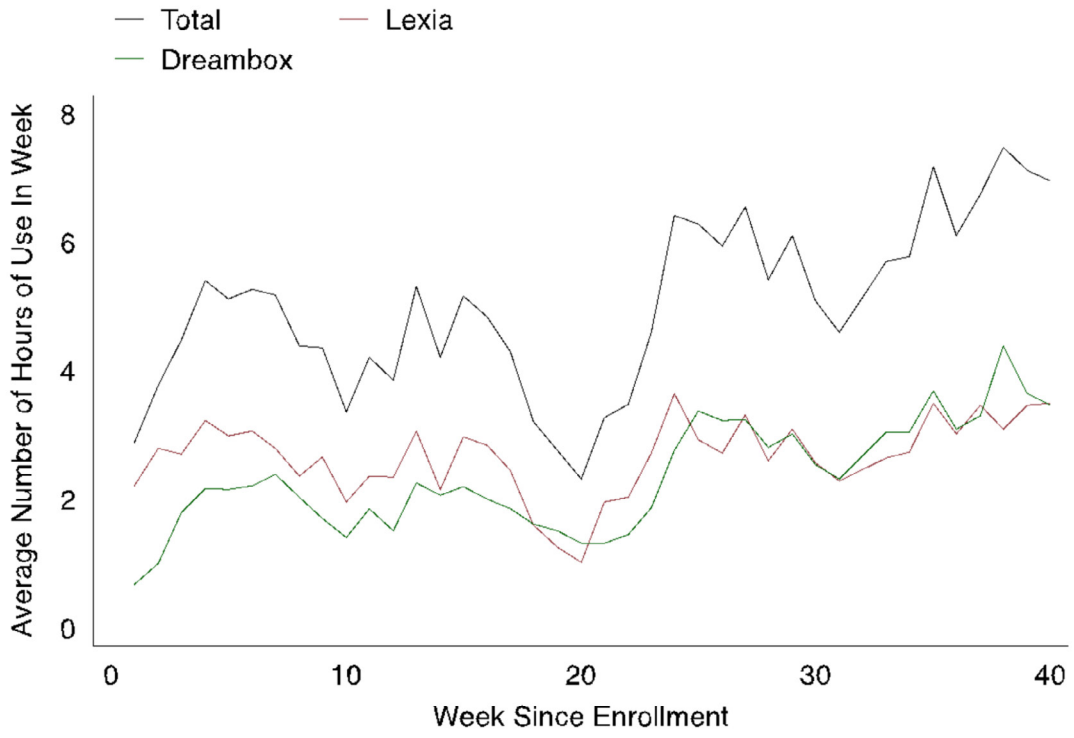
According to Gilliam and Barrett (2022) and our interviews with two SNUMA educators, SNUMA leaders set an explicit goal to help all students access grade-level content in math and ELA by the end of the 2020–21 school year, regardless of starting point. Though the emphasis of SNUMA was to mitigate learning loss in ELA and math, the program also provided instruction in science, social studies, music, writing and composition, art, novel study, and—for some students—foreign languages and theater.

The two educators we interviewed reported that diagnostic assessments embedded in Lexia and Dreambox platforms revealed that many students were behind grade level when they enrolled in SNUMA. Based on this information, SNUMA leaders backwards mapped the number of lessons students would need to complete weekly to ensure that they would access grade-level content by the end of the 2020–21 school year. These weekly targets for number of completed lessons dictated the amount of time each student used the platform each week.

Figure 2 presents the amount of time students spent on Dreambox and Lexia by week since they first used the platform. Students spent approximately two hours a week on Dreambox in the fall semester and about three hours a week in the second semester. Though there is some fluctuation across the year, students on average spent three hours a week on Lexia throughout the year. On average, students spent between four to six hours per week on the two platforms, or about an hour a day. This weekly usage is consistent with Gilliam and Barrett's (2022) interviews, in which teachers reported that students spent at most two hours per day online. The data in Figure 2 include Lexia Core5 and PowerUp from students in grades 1–8 and Dreambox data from students grades 3–8. Zearn did not provide usage data. Thus, these totals undercount by omitting math product usage for students in grades 1 and 2.

Appendix Figure 1 shows the average target use per week, as determined by the Lexia Core5 platform, and compares it to the actual student use of Lexia shown in Figure 2. In their materials for teachers, Lexia recommends about an hour of use per week during first weeks of using the platform, with the recommended daily usage steadily decreasing to ten minutes or less by the end of the school year. During the fall of 2020, SNUMA students were spending about three times the recommended amount of time using Lexia. Over the course of the school year, as developer-recommended usage declined, the gap between actual and recommended usage widened.

Figure 2. Average weekly use of Dreambox and Lexia, centered on week of first use



Note: Lexia sample contains 76 students who used Lexia Core5 and Lexia PowerUp. Dreambox sample contains 48 students who used Dreambox.

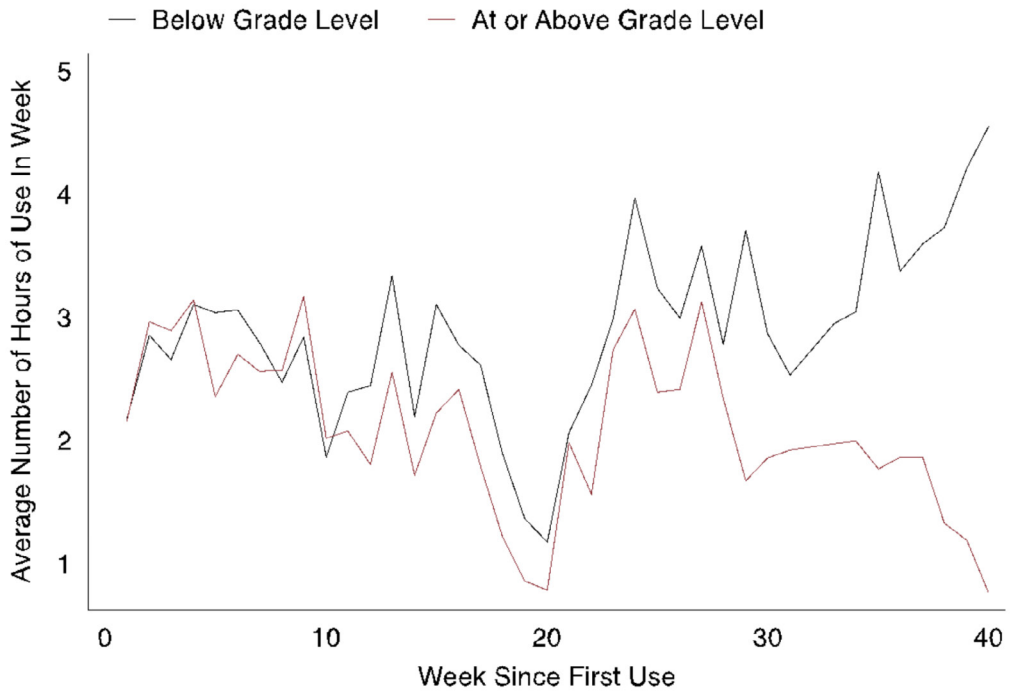
This approach taken by SNUMA leaders implied that students who started below grade level, as measured by Lexia, would be assigned to use the program more (i.e., would be assigned to complete more lessons) than those who started at or above grade level. Figure 3 confirms that this was the case when looking at Lexia Core5 data.[3] Although all SNUMA students started using the platform for about three hours per week in the first 10 weeks they were enrolled, usage diverged as the school year continued. Between the 10th and the 30th week of students' enrollment, students who started below grade level spent about 30 minutes to an hour more on Lexia than their peers who started at or above grade level. After week 30, the gap increased substantially: students who started below grade level spent between three and four hours on Lexia a week, and those at or above grade level decreased their usage to zero. This divergence in actual use of the online platforms is consistent with the accounts of the two SNUMA educators we interviewed: that the platforms were used in part to help students starting behind grade level access grade-level content by the end of the school year. Figure A2 plots the targeted use recommended by Lexia separately for students starting below grade level or at or above grade level. Though the program recommended about a half hour more usage for students below grade level, the usage of all SNUMA students eclipsed the recommended usage.

These usage results are difficult to interpret in the absence of systematic and representative data about how much time children spend on personalized learning platforms and without developer guidance about recommended usage in a variety of scenarios. We only found two studies that documented the amount of time students spent on platforms, both of which involved use in traditional school-based classrooms prior to the pandemic. SNUMA students' use of the platforms exceeded the use of students in these two cases. A longitudinal study of students from Kindergarten through second grade found that students on average used Lexia Core 5 about 70 minutes per week (Macaruso et al. 2019), which is a little less than half as much time as SNUMA students. A randomized controlled trial of the use of Dreambox in blended-learning classes in Rocketship Education found that students used it about 80 minutes a week (Wang and Woodworth 2011), which is about two-thirds as much time as SNUMA students. SNUMA employed at least two platforms per child, and the time spent online, compared to the usage described in these other studies, is substantial.

As we discuss later, the data we have do not allow us to probe the full effect of this amount of platform use on academic outcomes, particularly for students behind grade level, and on nonacademic outcomes such as social and emotional learning.

3 Lexia PowerUp provided more starting grade-level data for specific ELA skills, such as reading comprehension, word study, and grammar. As an overall assessment of student grade level was not given, these students were not included in Figure 3. There was not enough variation in starting grade level in Dreambox to support such an analysis, and Dreambox usage was not included in Figure 3.

Figure 3. Average weekly use of Lexia Core5, centered on week of first use, by initial student grade level



Note: Sample contains 64 students.

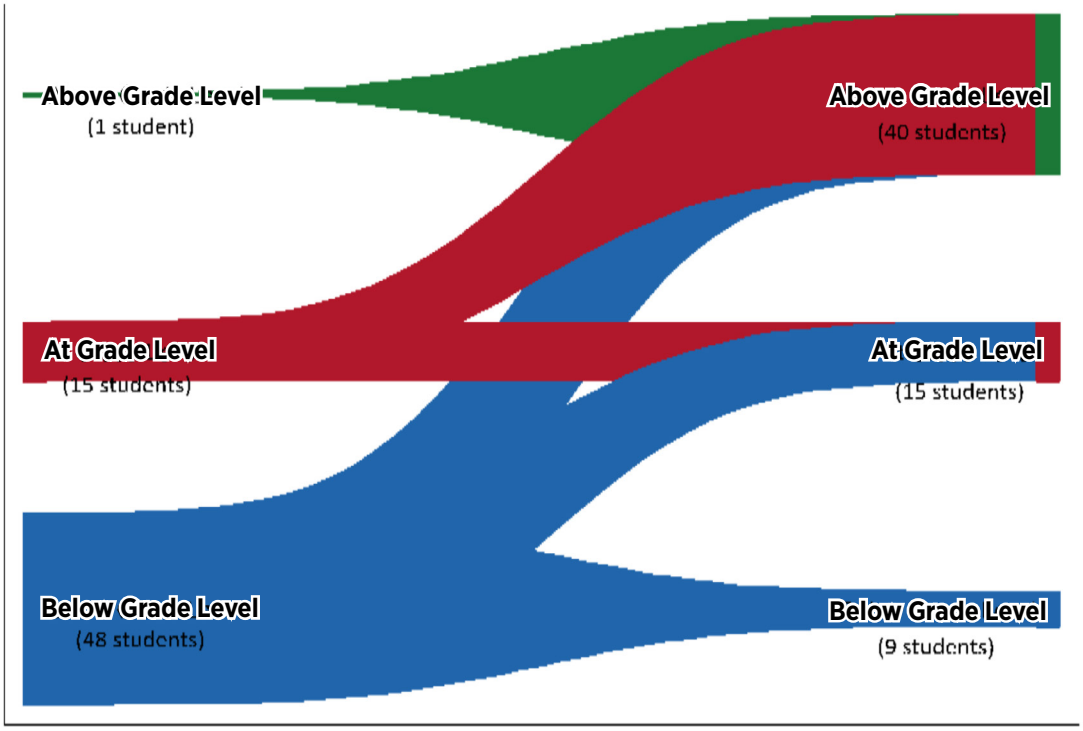
Based on the online platform metrics, most SNUMA students made substantial progress

We examined whether platform metrics indicated that students reached grade level by the end of the school year. As a reminder, Lexia Core5 estimated baseline and end line grade levels for each student, and RAND imputed these grade levels for Zearn based on the grade level of the lessons completed. These data indicate that students made substantial progress throughout the year.

Figure 4 shows the number of students by starting and ending grade levels, estimated by the products. Consistent with the accounts of the two SNUMA educators we interviewed, more than half of the students who used each platform were categorized as below grade level when they enrolled in SNUMA. Fifteen students in the Zearn platform were below grade level when they enrolled in SNUMA, and 48 students in the Lexia Core5 sample were below grade level. A majority of the remaining students were at grade level, and a small minority were above grade level.

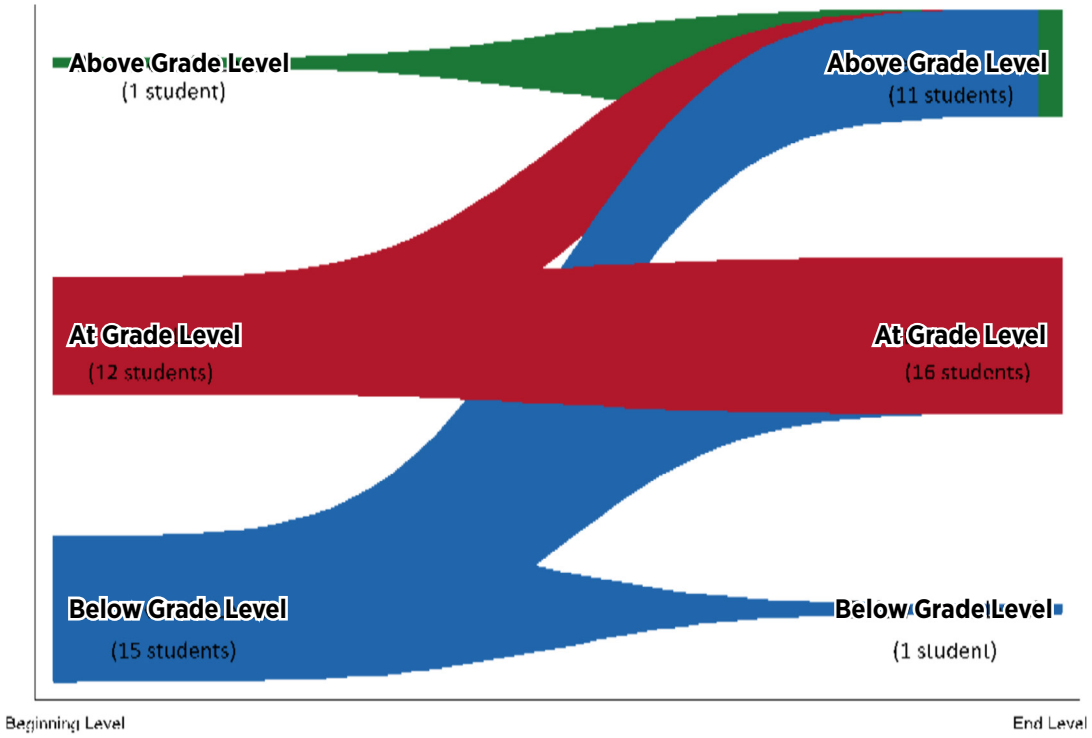
By the end of the year, only one student in the Zearn Math sample and nine students in the Lexia Core 5 sample remained below grade level, according to the platform estimates. While a majority of the Lexia Core5 sample, 40 students, scored above grade level, with the remainder scoring at grade level, a majority of the Zearn Math sample, 16 students, scored at grade level, with the remainder above grade level.

Figure 4. Student grade level progress from beginning to end of year, estimated by Zearn Math (panel 1) and Lexia Core5 (panel 2)



(b) Lexia Core5

Note: Zearn Math figure contains 28 students. Lexia Core5 figure contains 64 students.



(a) Zearn Math

We then used regression analysis to explore how student characteristics (race/ethnicity, gender, age, grade, weeks enrolled, and starting grade level) were related to measures of student use and progress on the platform. Although all three platforms provided multiple measures of student use and progress (see Table A1), most measures, such as the number of units, lessons, badges, activities, and benchmarks completed, were platform specific. The only measures consistently available across platforms were the number of weeks enrolled, the initial starting grade level, and the number of minutes students used the platforms.

We found that students who enrolled in SNUMA earlier and were thus able to use the platform for more weeks during the school year spent more minutes on the platforms and made more progress on the platforms, as measured by activities, lessons, units, badges, and standards completed. Tables A3–A5 in the appendix present the results for Lexia Core5, Zearn Math, and Dreambox, respectively. Though to some extent this relationship is expected, our results suggest that use of the platforms was productive in the sense that more time spent on the platform meant more progress through its academic content. Longer exposure to the platform (as measured by weeks of use during the school year) also increased the probability of scoring above grade level at the end of the year on the Lexia Core5 and Zearn Math platforms.

In addition, we found that students who started at a higher grade level made less progress on platform content. This is also expected, and the pattern is consistent with the accounts of the two SNUMA educators we interviewed, who said that children who were assessed as below grade level were assigned more time on the platform and thus more lessons. Notably, student race and ethnicity, gender, age, and grade did not predict on a consistent basis the time spent on the platforms or progress on the platform measures such as activities, lesson, units, badges, and standards completed, or ending grade levels, indicating that teachers assigned platforms use in similar ways for all students and that students made similar progress on the platforms. Once again, these results are difficult to interpret because we were unable to find other studies of personalized learning platforms that documented students' use with a similar level of detail.

Implications

As online learning platforms continue to become more common, educators and students may be more likely to use multiple platforms across several subject areas. In addition, learning models are becoming more diverse, with alternative models such as microschools proliferating as the pandemic has disrupted traditional schooling in the nation. As a result, personalized learning platforms may continue to be employed in various settings and in multiple ways, many of which may not have been anticipated by the platform developers. Yet, little is known about how these personalized learning platforms are used in different learning environments or how the amount of time students spend on these technologies might be related to academic or other outcomes. We do not know what the range of optimal use cases might be, how developer recommendations for usage might vary by case, or how actual usage might vary by learning environment or by student learning needs.

In this example, we found that SNUMA students used various personalized learning platforms for more hours per week than developers recommended and more than students in two other studies that documented platform use in prepandemic school classrooms. We also found that SNUMA students made substantial progress according to the platform's built-in metrics. These descriptive results are encouraging but difficult to interpret for two reasons.

First, our lack of an external comparison group of students means that we do not know if SNUMA's approach—including the amount of time spent on the platforms—was more or less effective for student learning than other educational approaches, such as a different way of using personalized learning platforms or instruction that does not include personalized learning platforms. Second, we do not know how SNUMA's approach influenced nonacademic student outcomes. In this section we discuss these limitations in more detail and suggest directions for future research.

Limitations of our analysis

The use of personalized learning platforms in one specific case—SNUMA—is illustrative of an approach that heavily leverages personalized learning platforms, in addition to in-person instruction. We found that SNUMA students made progress according to platform metrics of progression through the lessons/content on each platform and changes in platform estimates of grade level (below/on/above). In one sense, these results are encouraging: they indicate that the applications were successfully used to help students access grade-level content, as measured by the platforms at the end of the year. A more nuanced understanding of whether a specific use case is beneficial for children would require a set of comparison students who experienced a different educational approach and measuring a varied set of student outcomes. The small number of SNUMA students, the likely select group of families that sought out and availed themselves of this opportunity, and the lack of a variety of standardized assessments fielded to both SNUMA and other students prevented us from taking this approach.

Thus, we must rely on platform metrics. Like any curricula adopted by teachers, the assessments deployed in a curriculum can be aligned to state or Common Core standards but are inherently incomparable to assessments from other curriculum providers, even in the same subject. This means that teachers and researchers can judge progress toward material aligned to external standards, but they cannot directly compare the progress for students who are using different curricula or platforms.

Directions for future research

We see potential opportunities to overcome these limitations and gather detailed formative data about students, which would allow researchers and teachers to compare the progress of students using different personalized learning platforms in the same subject. One approach might be to embed standardized formative assessments across platforms. For example, the MAP assessment, developed by NWEA, is a widely used, validated formative assessment of math and ELA. When administered at more than one time point, it is designed to measure student

academic growth (rather than achievement level) and is thus particularly well suited to measuring the progress of students who are performing off grade level and who are exposed to adaptive learning approaches.

If the MAP, or some similar validated assessment, could be systematically embedded as formative assessments across all platforms, teachers and researchers could use the data to compare the progress of their students against a large group of peers, including those who use other platforms, those who use the platforms in a variety of ways, and those who do not use the platforms. To the extent that platforms embed standardized assessments of other important outcomes—such as social and emotional learning—in their platforms, teachers and researchers can better understand the development of a larger set of skills across platforms and learning contexts. The data can also aid researchers in making more nuanced determinations of student progress throughout the year, instead of depending on end-of-year summative assessments. Though researchers will still have to account for the selection of students and families into programs that use adaptive learning platforms, the strategic embedding of standardized formative assessments could provide all stakeholders with more nuanced and comparable data across the education system.

At the same time, we urge funders and researchers to investigate implementation of personalized learning platforms in a variety of settings to contextualize an understanding of student outcomes. Instructional time is a finite resource. Decisions about how much time students should spend using personalized learning platforms—as with any decision about how to spend instructional time—inherently contains trade-offs. For example, while a student is using a personalized learning platform, they are not able to participate in other educational approaches or activities. Future research should examine these trade-offs by comparing models that use personalized learning platforms for different amounts of time and tracking the other educational activities that students do—and do not—participate in as a result. Implementation studies should explore how platforms are used by specific teachers and program-wide goals for their use—context that was crucial for interpreting the SNUMA results—as well as student experiences and perceptions, including the extent to which students use them outside the classroom. Such studies could also explore parent perceptions and experiences.

We also urge researchers to examine a broader set of student outcomes, such as students' social and emotional outcomes, as well as academic learning outcomes. Ample research shows that student learning is multidimensional and that developing students' social-emotional skills has benefits, including increased academic performance (Durlak et al. 2011; Taylor et al. 2017). Little is known how the use of personalized learning platforms can promote—or inhibit—these other facets of a child's development. A more holistic assessment of extensive platform use would be particularly relevant in the case of SNUMA, where some children were assigned more time on the platform to catch up on academic skills and thus may have had less exposure to other forms of instruction or to experiences that could develop their social and emotional skills.

Collectively, this body of work could aim to identify optimal use cases that balance student needs for a variety of instructional strategies, socialization, and academic learning. Future studies should examine equity of use, implementation, and student outcomes, particularly if personalized learning platforms are used to address

interrupted learning. Overall, the proliferation of education technologies, particularly personalized learning platforms, provides an opportunity to continue to do rigorous research to better understand how to best deploy the platforms in different contexts. Platforms, however, also allow for the more efficient collection of data, and embedding standardized assessments into the platforms can not only aid these rigorous studies but also provide teachers and students a better understanding of their progress compared to students across different educational contexts.

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