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Best Practices for Creating Strong Blended Learning Environments for Mathematics in Utah: Report on Teacher and Student Survey Results

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THE UNIVERSITY OF UTAH
UTAH EDUCATION POLICY CENTER

Prepared by the Utah Education Policy Center for the STEM Action Center

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UTAH EDUCATION POLICY CENTER

Bridging Research, Policy, and Practice

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Background

Mathematics Performance Among K-12 Students

In 2018, the National Council of Supervisors of Mathematics (NCSM) and the National Council of Teachers of Mathematics (NCTM) released a joint position statement, arguing that students need a strong foundation in mathematics to succeed in Science, Technology, Engineering, and Mathematics (STEM) fields and, increasingly, to find creative solutions to complex societal problems (NCSM and NCTM, 2018). Data from myriad sources indicates, however, that students in the United States are not faring well in mathematics (National Science Board (NSB), 2021). For example, on the 2019 TIMSS assessment, fourth and eighth grade students in East Asian countries – including Singapore and Japan – performed substantially better than students in the United States (Mullis, Martin, Roy, Kelly, & Fishbein, 2020). Although mathematics scores of U.S. students on the National Assessment of Educational Progress (NAEP) improved among both 4th graders and 8th graders from 1990 to 2007, scores were stagnant from 2007 to 2019 (NSB, 2021) and plummeted in the wake of the Covid-19 pandemic (U.S. Department of Education et al., 2022). For fourth graders, 2022 NAEP scores in mathematics were lower than all previous assessments since 2005. For eighth graders, 2022 scores were lower than all previous assessments since 2003 (U.S. Department of Education et al., 2022).

Consistent with national trends (see Goldhaber, Kane, McEachin, Morton, Patterson, & Staiger, 2022, Hammerstein, König, Dreisörner, & Frey, 2021, and Lewis & Kuhfeld, 2021 for reviews), a report released by the USBE in October 2021 suggests that pandemic-related learning disruptions were associated with substantial learning loss in Utah as well. Analyses of student RISE and Utah Aspire Plus assessments revealed that scores were lower in 2020-2021 than in 2018-2019 at all grade levels (i.e., Grades 5 – 10) and all content areas (i.e., English and language arts, math, and science) examined in the report (USBE and the National Center for the Improvement of Educational Assessment, Inc., 2021).[1] Some of the largest differences in academic achievement scores across these years appeared on mathematics assessments and among students who were economically marginalized. In 2022, only 27.2% of students who were economically marginalized were proficient in math compared to 44.5% of all students. This finding is particularly sobering given the USBE's goals for raising proficiency rates, especially among groups who have been economically marginalized or historically-underperforming. The target proficiency rate for students who are economically marginalized in math was 55.8% by 2022 (USBE Strategic Plan Implementation Update, 2022).

Although scores on NWEA Math and other assessments show some signs of "academic rebounding," researchers are estimating that full recovery may take years, especially for Black and Hispanic students and students in high-poverty schools. This finding reflects both pre-existing disparities in mathematics achievement by race/ethnicity and school-poverty levels (Lewis, Kuhfeld, Langi, Peters, & Fahle, 2022) and evidence that these students were disproportionately affected by the pandemic (Kuhfeld & Lewis, 2022; Lewis & Kuhfeld, 2022).

Math Learning Software

One strategy that has been employed to address student underperformance in mathematics has been to increase the utilization of educational technology – including math learning software – to supplement mathematics instruction. Supporting these efforts, several recent meta-analyses have linked the use of educational technology to positive achievement outcomes in mathematics for K-12 students (e.g., Cheung & Slavin, 2013; Hillmayr, Ziernwald, Reinhold, & Hofer, 2020; Ma, Adesope, Nesbit, & Liu, 2014). Similar results have been reported in Utah, where research conducted by the Utah Education Policy Center (UEPC) for Utah's STEM Action Center has demonstrated that students who use math learning software provided through STEM Action Center's K-12 Math Personalized Learning Software Grant program[2] are more likely to be proficient in and to demonstrate growth in mathematics than non-users, especially when usage levels are

[1] RISE and Utah Aspire Plus assessments were not administered in 2019-2020 because of the Covid-19 pandemic.

[2] https://stem.utah.gov/educators/funding/k-12-math-personalized-learning-software-grant/

relatively high (e.g., Altermatt, Altermatt, Rorrer, & Moore, 2022; Su, Rorrer, Owens, Pecsok, Moore, & Ni, 2020).

Importantly, however, the effects of educational technology interventions on student achievement outcomes appear to be relatively modest and moderated by a variety of factors including the type of educational technology used (Ran, Kasli, & Secada, 2021) and the duration, intensity, and quality of use (e.g., Campuzano, Dynarski, Agodini, & Rall, 2009; Cheung & Slavin, 2013; Su et al., 2020). More work is needed to understand these moderating factors given growing evidence for a "digital use divide" in U.S. schools – and in Utah's schools – wherein some students are using technology in ways that enhance their mathematics learning while other students are using technology in ways that lead to student disengagement and educator disaffection (Altermatt, Rorrer, & Moore, 2022; Valadez & Duran, 2007; U.S. Department of Education, 2017).

Blended Learning

There is a growing consensus that, to be effective, math learning software needs to be integrated with high-quality mathematics instruction in ways that create strong "blended learning" environments. "Blended learning" has been defined as "a personalized learning approach that combines online and face-to-face instruction to differentiate the content, pace, and difficulty of instruction for each student" (REL Mid-Atlantic, 2017). Although there is some evidence that blended learning interventions can improve student outcomes (Brodersen & Melluso, 2017; Means, Toyama, Murphy, & Baki, 2013; Powell et al., 2015), a recent review of the extant literature indicates that "research has yet to definitively identify the strategies for implementing blended learning that increase the positive effects on students" (REL Mid-Atlantic, 2017; see also Huebner & Burstein, 2023).

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(REL Mid-Atlantic, 2017)

Still, some promising practices for blended learning have emerged in recent studies. For example, the RAND Corporation has released a series of studies comparing the instructional practices of educators in schools that received Next Generation Learning Challenges (NGLC) grant funding to implement schoolwide personalized learning opportunities for students to a comparison group of educators (Pane, Steiner, Baird, & Hamilton, 2015; Pane, Steiner, Baird, Hamilton, & Paine, 2017). Compared to other educators, educators in NGLC schools were:

- more likely to use technology for personalization,
- more likely to require that students practice material until they demonstrate competency,
- more likely to share data with students and encourage students to use data to track their own learning progress, and
- more likely to use student grouping strategies based on data.

Similar results were found in a recent study conducted by the UEPC. In this study, the UEPC used data provided by six math learning software vendors and data provided by the USBE to identify educators who, over a three-year period, were in the top 25% of educators in the state on both a metric of math learning software engagement (i.e., mean number of minutes students in their classrooms used the software each month) and a metric of achievement (e.g., mean student growth percentile or percent of students proficient in math on the state's assessment). In structured interviews with a sample of these educators who attended the 2022 STEM Best Practices Conference hosted by Utah's STEM Action Center, educators who were identified as "positive outliers" reported that they viewed math learning software as an important contributor to student success. Specifically, these educators indicated that they used the software to gauge student understanding and to provide data-informed, tailored instruction and opportunities for practice. In contrast, educators who were not in the "positive outlier" group were more ambivalent about the value of math learning software and reported rarely accessing or using data from this software to inform instruction (Altermatt, Rorrer, & Moore, 2022).

Study Overview

In partnership with the Utah State Board of Education (USBE) and Utah's STEM Action Center, the Utah Education Policy Center (UEPC) administered surveys to teachers and students in Utah in Spring 2023 with the goal of understanding best practices for creating strong blended learning environments in mathematics. In Fall 2023, teacher and student survey responses will be joined with educator demographic data and student demographic and achievement data[3] to test hypotheses about associations between math instructional approaches, math software implementation practices, and educator and student outcomes. For example, survey responses will be used to empirically test the hypotheses that teachers who report setting mastery-based goals for math instruction (in general) and software use (in particular) and who use data from software to inform their instruction have students with more positive attitudes toward and higher achievement in math.

Teacher Survey Overview

The teacher survey was designed by the UEPC to assess teachers' general instructional strategies in math (including their use of personalized, competency-based instructional strategies), strategies for using math learning software, perceptions of math learning software, and self-efficacy for teaching mathematics. Only teachers who reported using math learning software were asked to complete items about the software. Items tapping general mathematics instructional strategies and some software implementation strategies were adapted from items developed by the RAND Corporation – with funding from the Bill & Melinda Gates Foundation – for a series of reports on personalized learning implementation and its effects. The work conducted by the RAND Corporation is licensed under a Creative Commons Attribution 4.0 International License which permits users to "transform and build upon the material" included in associated reports without further permission or fees (Pane et al., 2017).

The UEPC distributed email invitations to complete the teacher survey to 16,923 teachers in Utah beginning in March 2023. Each invitation included a description of the study, a personalized link to the teacher survey, and an anonymous link to the student survey.

The distribution list for email invitations included all K - 6th grade teachers as well as all math teachers for 7th - 12th grades. By May 16, 2023, 2,416 teachers had responded to the survey, representing a 14.3% response rate. Of these respondents, 2,020 (83.6%) confirmed that they taught math and consented to participate, 124 (5.1%) indicated that they did not teach math, and 272 (11.3%) declined to participate.

The analytic sample for the current report includes the 1,841 respondents who consented to participate, indicated that they taught math, and completed at least 20% of the survey. An Appendix to this report provides evidence that the *population* of teachers who were invited to participate in the survey was quite similar to the *sample* of teachers in the analytic sample who completed the survey using a personalized link (n = 1,683). These comparisons increase our confidence that the results presented in the current report and in associated research briefs can be generalized to the population of math teachers in Utah.

[3] The Utah Education Policy Center has a Master Data Sharing Agreement with the Utah State Board of Education for use of education data for evaluation and research purposes. The UEPC adheres to terms of the Master Data Sharing Agreement, including terms of use, confidentiality and non-disclosure, data security, monitoring, and applicable laws. The UEPC also complies with University of Utah Institutional Review Board policies for educational research and evaluation. Though the UEPC is housed at the University of Utah, only authorized UEPC staff may access the data, and data are not available throughout the University or to other parties. The views expressed in this report are those of UEPC staff and do not necessarily reflect the views or positions of the USBE or the University of Utah.

Student Survey Overview

The student survey was designed by the UEPC to assess students' attitudes toward math and their use and perceptions of math learning software. The student survey includes items that were designed by the UEPC for prior evaluations of STEM Action Center's K-12 Digital Math Program and items from the Student Attitudes Toward STEM (S-STEM) Survey (Faber et al., 2013). Only students who reported using math learning software were asked to complete items about the software.

Email invitations to teachers included an anonymous link to the student survey. Teachers were encouraged to share the link with 3rd – 12th grade students in their math classes. By May 30, 2023, 11,849 Utah students completed the survey.

Report Overview

The current report provides descriptive statistics (e.g., frequencies, means, and standard deviations) that summarize responses to the teacher survey (pp. 9 – 17) and student survey (pp. 18 – 20). Results from additional analyses of survey data will be reported in a series of short research briefs. Each research brief will focus on a single or small set of applied research questions. A key focus of these analyses will be to determine whether and how associations between key variables (e.g., teacher software implementation practices and student achievement) are moderated by school characteristics (e.g., % of students in the school who qualify for free- or reduced-price lunch) and teacher characteristics (e.g., # of years of teaching experience).

Descriptive Statistics from Teacher Survey

1 | How many years have you been teaching math? Please do not include the current school year in your response.

Minimum	Maximum	Mean	Median
0	45	12.20	10

Note. The number of respondents for this item was 1,841.

2 | Please indicate the degree to which the following statements describe your approach to teaching math.

	Not at all (1)	To some extent (2)	To a moderate extent (3)	To a great extent (4)	Mean	Standard Deviation
1. My students have opportunities to choose what instructional materials (such as books or software) they focus on in math class	51.5%	37.2%	9.2%	2.1%	1.62	.74
2. My students have opportunities to choose what topics they focus on in math class	65.8%	29.2%	4.3%	0.7%	1.40	.61
3. I frequently adapt math course content to meet students' needs by providing additional assignments, resources, and activities for remediation or enrichment	1.0%	18.1%	39.4%	41.5%	3.21	.77
4. I clearly present the goal or objective for each math assignment	1.1%	14.0%	34.4%	50.5%	3.34	.76
5. I have adopted strategies that allow students to keep track of their own learning progress in math	10.7%	41.8%	31.8%	15.7%	2.53	.88
6. I require students to demonstrate mastery of a topic in math before they can move on to a new topic	19.7%	47.7%	24.9%	7.6%	2.20	.84
7. Different students work on different topics or skills in math at the same time	27.4%	45.2%	18.1%	9.3%	2.09	.91
8. I give students the chance to work through instructional material in math at a faster or slower pace than other students in this class	13.6%	47.8%	24.8%	13.9%	2.39	.89
9. My students keep track of their own learning progress in math using technology (for example, by using an online grade book or portfolio)	41.3%	28.0%	15.5%	15.2%	2.05	1.08

10. My students have opportunities to review or practice new material in math until they fully understand it.	4.6%	36.0%	37.9%	21.6%	2.76	.84
11. When my students are working independently in math, I require them to get through a certain amount of material even if they are working at their own pace	15.1%	37.4%	33.4%	14.1%	2.46	.91
12. I frequently regroup students for instruction to address changing learning needs and interests	10.9%	34.5%	30.4%	24.1%	2.68	.96
13. My students are able to access instructional materials for math both in and outside of the classroom	5.9%	25.8%	24.8%	43.5%	3.06	.96
14. I provide a variety of materials or instructional approaches in math to accommodate individual needs and interests	1.8%	24.0%	44.0%	30.2%	3.03	.78
15. I connect what students are learning in math with experiences they have throughout the rest of the school day or outside of school	2.8%	34.3%	42.6%	20.2%	2.80	.79

Note. The number of respondents for these items ranged from 1,824 to 1,832. Numbers in columns to the left of the mean and standard deviation (SD) represent the percentage of respondents who selected each response choice. Percentages for each item sum to 100%.

3 | Are you using a learning software program to support your instruction in math this year?

Yes	No
82.8%	17.2%

Note. The number of respondents for this item was 1,837. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%,

4 | Please choose the learning software program that you are using to support your instruction in math this year. If you have used more than one program, please choose the program that you have used the most.

ALEKS	Derivita	DreamBox	Freckle Math	i-Ready	Imagine Math	IXL	Khan Academy
11.4%	3.1%	3.0%	0.6%	38.0%	7.4%	6.4%	0.7%

Mathspace	ST Math	Zearn	Other
0.7%	10.9%	2.8%	15.1%

Note. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,520. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%. Among the most frequent "other" responses were Big Ideas Math, DeltaMath, Desmos, Reflex Math, SplashLearrn, and XtraMath. Personalized text piping was used throughout the remainder of the survey such that [math software] was replaced with the name of the software program respondents used.

5 | In what grades are you using [math software] to support your math instruction? (select all that apply)

K	1	2	3	4	5	6	7
7.2%	11.0%	11.1%	14.1%	14.7%	14.7%	13.3%	6.4%

8	9	10	11	12
6.6%	7.3%	6.7%	5.3%	3.3%

Note. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,521. Numbers represent the percentage of respondents who selected each response choice. Percentages do not sum to 100% as respondents could select more than one grade level.

6 | What math class are you teaching? If you teach more than one math class, please select the class in which you use [math software] the most to support your math instruction. Please answer all remaining questions with this math class in mind.

7th Grade Math	8th Grade Math	Secondary Math 1	Secondary Math 2	Secondary Math 3	Algebra 2	Calculus
17.4%	19.8%	21.3%	17.1%	11.4%	0.3%	0.3%

Statistics	AP Calculus	IB Math	College Prep Math	Mathematics of Personal Finance	Other
0.3%	0.3%	0.3%	0.3%	0.3%	11.1%

Note. Only participants who reported using software AND who taught students in 7th grade and above were asked to respond to this item. The number of respondents was 334. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

7 | How many years have you been using [math software] to support your math instruction?

Minimum	Maximum	Mean	Median
0	20	3.10	2

Note. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,521.

8 | During a typical week, how many minutes do students in your math class, on average, spend using [math software] *during* the regular school day?

Minimum	Maximum	Mean	Median
0	150	42.235	40

Note. Numbers represent average number of minutes per week. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,494.

9 | During a typical week, how many minutes do students in your math class spend, on average, using [math software] *outside* of the regular school day (e.g., for homework)?

Minimum	Maximum	Mean	Median
0	150	13.87	5

Note. Numbers represent average number of minutes per week. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,494.

10 | Who is typically present when students use [math software]? (select all that apply)

I am present	Another teacher is present	A tutor is present	Other (please explain)
92.4%	11.1%	6.2%	12.6%

Note. Only participants who reported using software were asked to respond to this item. The number of respondents was 1,521. Numbers represent the percentage of respondents who selected each response choice. Percentages do not sum to 100% as respondents could select more than one response choice. The most frequently used "other" responses were paraeducators or other aides and family members.

11 | How frequently do students use [math software] in the following ways in your math class?

	Never (1)	Once a year (2)	A few times a year (3)	Monthly (4)	A few times/ month (5)	Weekly (6)	A few times/ week (7)	Daily (8)	Mean	SD
1. Large group or whole class instruction (more than 10 students) with a teacher or tutor	40.2%	2.3%	9.9%	4.1%	6.0%	9.1%	9.9%	18.5%	3.93	2.84
2. Small group instruction (2 - 10 students) with a teacher or tutor	44.3%	1.9%	10.3%	4.0%	10.6%	10.4%	11.4%	7.1%	3.47	2.56
3. Individual instruction with a teacher or tutor	35.5%	1.3%	11.3%	5.7%	9.7%	15.1%	11.8%	9.4%	3.92	2.58
4. Paired or small group work with other students	50.3%	1.3%	7.6%	4.1%	8.3%	10.6%	10.0%	7.8%	3.30	2.61
5. Independent work	2.2%	0.3%	1.7%	1.8%	4.8%	14.9%	23.5%	50.8%	7.00	1.46

Note. Only participants who reported using software were asked to respond to this item. The number of respondents ranged from 1,405 to 1,422 across items. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

12 | Please indicate the degree to which the following statements describe your experience with or approach to using [math software] in your math class.

	NA (X)	Not at all (1)	To some extent (2)	To a moderate extent (3)	To a great extent (4)	Mean	Standard Deviation
1. A teacher or tutor chooses what topics or skills students focus on when using [math software]	11.8%	11.5%	29.0%	19.1%	28.6%	2.74	1.05
2. Students choose what topics or skills they focus on when using [math software]	25.1%	31.5%	25.8%	9.7%	7.9%	1.92	0.98
3. The topics or skills students focus on is determined by [math software]	5.3%	9.5%	20.4%	18.5%	46.2%	3.07	1.05
4. Different students work on different topics or skills at the same time when using [math software]	3.1%	5.8%	15.8%	16.3%	59.0%	3.33	0.95

Note. Only participants who reported using software were asked to respond to this item. The number of respondents ranged from 1,424 to 1,430 across items. Numbers represent the percentage of respondents who selected each response choice. NA indicates that a participant indicated that the software doesn't allow a particular activity or that the respondent didn't know how to use the software in this way. Percentages sum to 100%. Means and standard deviations are calculated after NAs are removed.

13 | Please indicate the degree to which the following statements describe your experience with or approach to using [math software] in your math class.

	Not at all (1)	To some extent (2)	To a moderate extent (3)	To a great extent (4)	Mean	Standard Deviation
5. I am typically completing other tasks while students are working on [math software] (e.g., small group instruction, grading, email, lesson planning)	16.4%	31.9%	21.6%	30.0%	2.65	1.08
6. I am able to multitask while students are working on [math software]]. I accomplish other tasks, but I am routinely called on by students who need my support	15.0%	33.1%	27.6%	24.3%	2.61	1.01
7. When students use [math software], my attention is focused on supporting students as they work	8.6%	33.3%	29.2%	28.8%	2.78	0.96
8. I require students to spend a certain amount of time using [math software]	15.8%	23.6%	22.9%	37.6%	2.82	1.10
9. I require students to get through a certain amount of material (e.g., units) when using [math software]	23.7%	29.9%	23.4%	23.0%	2.46	1.09
10. I require students to demonstrate mastery of a certain number of concepts, topics, or skills when using [math software]	23.6%	29.4%	26.6%	20.5%	2.44	1.06
11. I require students to get a certain score when using [math software]	40.6%	23.9%	18.4%	17.0%	2.12	1.12
12. I require students to keep track of their own learning progress when using [math software]	32.4%	31.0%	20.3%	16.3%	2.21	1.07
13. If students run into trouble when using [math software], someone (e.g., myself or another teacher or tutor) is able to provide help quickly	2.7%	14.1%	26.1%	57.1%	3.38	0.83

Note. Only participants who reported using software were asked to respond to these items. Moreover, only teachers who indicated that they were present when students were using software were asked to respond to items 5, 6, and 7. The number of respondents ranged from 1,344 to 1,431 across items. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

14 | How frequently do you view the following types of information about the performance of your students on [math software]?

	NA (X)	Never (1)	Once a year (2)	A few times a year (3)	Monthly (4)	A few times/ month (5)	Weekly (6)	A few times/ week (7)	Daily (8)	Mean	Std Dev
1. Information about overall performance (e.g., overall diagnostic scores) at the **class** level	6.2%	3.1%	1.1%	21.4%	10.6%	13.5%	19.8%	12.4%	11.9%	5.12	1.88
2. Information about overall performance (e.g., overall diagnostic scores) at the **student** level	5.9%	2.1%	1.0%	22.1%	11.8%	13.3%	20.6%	12.3%	10.7%	5.10	1.81
3. Information about performance on specific concepts, topics, or skills at the **class** level	7.5%	5.6%	1.6%	15.8%	12.7%	14.7%	21.9%	10.3%	9.9%	5.01	1.89
4. Information about student performance on specific concepts, topics, or skills at the **student** level	5.6%	3.4%	1.2%	13.7%	11.4%	15.5%	24.4%	12.7%	12.2%	5.32	1.81
5. Information about student usage (e.g., # of minutes of use)	4.8%	5.1%	1.2%	8.1%	8.6%	11.1%	26.7%	14.0	20.4%	5.71	1.92
6. Information about student progress (e.g., # of tasks or units completed)	4.6%	2.4%	0.8%	8.5%	9.1%	13.4%	27.8%	14.3%	19.0%	5.79	1.73

Note. Only participants who reported using software were asked to respond to these items. The number of respondents ranged from 1,362 to 1,368 across items. Numbers represent the percentage of respondents who selected each response choice. NA indicates that a participant indicated that the software doesn't allow this or that the respondent doesn't know how to access this information. Percentages sum to 100%. Means and standard deviations are calculated after NAs are removed.

15 | To what extent have you used student data that you have received or generated from math learning software for each of the following purposes in your math class? ***If the activity is something that you don't do (for example, if you never tailor the pace of instruction), please mark "I don't do this."***

	NA (X)	Did not use data from software for this at all (1)	Used data from software to a small extent (2)	Used data from software to a moderate extent (3)	Used data from software to a large extent (4)	Mean	Standard Deviation
1. Adapting course pacing or content to meet the needs of the class	21.2%	20.5%	28.4%	20.8%	9.1%	2.23	0.97
2. Tailoring the pace of instruction to meet individual students' needs	20.7%	21.7%	28.8%	20.2%	8.7%	2.20	0.96
3. Developing recommendations for tutoring or other educational support services for particular students	22.6%	17.3%	28.0%	21.7%	10.4%	2.33	0.97
4. Assigning students to extended learning opportunities (for example, extended-day programs, Saturday classes, or an extended school year)	50.4%	18.2%	13.6%	12.4%	5.3%	2.10	1.02
5. Identifying topics requiring more or less emphasis in instruction	17.4%	18.5%	27.3%	25.8%	11.0%	2.35	0.97
6. Identifying areas where I need to strengthen my content knowledge or teaching skills	18.6%	22.7%	25.4%	23.0%	10.3%	2.26	1.00
7. Reflecting on and discussing teaching and learning with other teachers	17.2%	21.9%	27.4%	23.3%	10.2%	2.26	0.98
8. Reflecting on and discussing learning with my students	14.3%	18.4%	33.2%	24.6%	9.5%	2.29	0.93
9. Assigning students to groups based on ability	29.1%	24.4%	20.9%	16.9%	8.6%	2.14	1.03
10. Changing the composition of groups based on students' learning	27.3%	25.6%	22.0%	16.7%	8.4%	2.11	1.02

Note. Only participants who reported using software were asked to respond to this item. The number of respondents ranged from 1,352 to 1,366 across items. Numbers represent the percentage of respondents who selected each response choice. NA indicates that a participant indicated that they don't engage in this activity. Percentages sum to 100%. Means and standard deviations are calculated after NAs are removed.

16 | Please rate your level of agreement with the following statements.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Mean	Standard Deviation
1. [Math software] helps my students improve their confidence in math	1.9%	4.0%	18.3%	54.3%	21.4%	3.89	0.85
2. [Math software] helps my students improve their skills in math	0.9%	1.9%	10.1%	56.3%	30.9%	4.14	0.74
3. [Math software] helps me address the learning needs of all of my students in math	2.3%	8.1%	21.6%	44.8%	23.2%	3.79	0.97
4. [Math software] helps me adapt the pace or content of instruction to meet my students' needs in math	4.4%	12.3%	33.5%	35.7%	14.2%	3.43	1.02
5. [Math software] provides real-time data that is actionable in math	2.2%	5.2%	21.1%	44.5%	26.9%	3.89	0.94
6. [Math software] provides information at a level of detail that helps me inform my instruction (e.g., breakdowns by specific skills or topics) in math	2.7%	8.9%	28.2%	41.8%	18.4%	3.64	0.97
7. I have the necessary skills and experiences to use data from [math software] to guide my instruction in math	3.8%	11.5%	21.3%	41.6%	21.8%	3.66	1.06
8. I have the necessary time to use data from [math software] to guide my instruction in math	13.8%	26.3%	24.5%	25.9%	9.5%	2.91	1.20
9. I have the necessary supports (e.g., from administrators, other teachers, or the vendor) to use [math software] to guide my instruction in math	6.8%	14.6%	27.7%	35.8%	15.0%	3.38	1.11

Note. Only participants who reported using software were asked to respond to these items. The number of respondents ranged from 1,348 to 1,354 across items. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

17 | Please rate your level of agreement with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean	Standard Deviation
1. I am continually improving my teaching practices in math	0.2%	0.4%	3.0%	47.0%	49.3%	4.45	0.60
2. I know the steps necessary to teach math effectively	0.1%	0.9%	6.3%	54.2%	38.5%	4.30	0.63
3. I am confident that I can teach math effectively	0.2%	1.5%	7.4%	49.1%	41.9%	4.31	0.69
4. I wonder if I have the necessary skills to teach math	24.7%	43.6%	19.4%	9.3%	2.9%	2.22	1.01
5. I understand math concepts well enough to be effective in teaching math	0.3%	0.3%	4.3%	44.7%	50.4%	4.45	0.62
6. Given a choice, I would invite a colleague to evaluate my math teaching	1.7%	4.3%	17.1%	45.7%	31.1%	4.00	0.90
7. I am confident I can answer my students' math questions	0.2%	0.2%	3.0%	39.9%	56.7%	4.53	0.59
8. When a student has difficulty understanding a math concept, I am confident that I know how to help the student understand it better	0.2%	1.2%	6.1%	48.1%	44.3%	4.35	0.67
9. When teaching math, I am confident enough to welcome student questions	0.1%	0.2%	1.9%	33.4%	64.4%	4.62	0.54
10. I know what to do to increase my students' interest in math	1.0%	8.4%	20.1%	48.4%	22.1%	3.82	0.90
11. I am confident in my ability to meet the individual interests and needs of students in math	0.4%	4.9%	14.5%	52.7%	27.5%	4.02	0.81

Note. The number of respondents for these items ranged from 1,640 to 1,645. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

Descriptive Statistics from Student Survey

1 | What grade are you in?

3rd	4th	5th	6th	7th	8th	9th	10th
12.1%	16.3%	13.2%	18.3%	8.7%	10.1%	10.1%	5.5%

11th	12th
4.6%	1.0%

Note. The number of respondents for this item was 11,849. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

2 | What math class(es) are you taking this year?

7th Grade Math	8th Grade Math	Secondary Math 1	Secondary Math 2	Secondary Math 3	Algebra 2	Precalculus	Calculus
20.4%	24.0%	25.4%	15.5%	9.5%	0.5%	0.7%	0.2%

Statistics	AP Calculus	AP Statistics	IB Math	College Prep Math	Mathematics of Personal Finance	Modern Mathematics	Other
0.7%	0.5%	0.3%	0.2%	0.6%	0.5%	0.5%	5.9%

Note. Only participants who were in 7th grade and above were asked to respond to this item. The number of respondents was 4,746. Numbers represent the percentage of respondents who selected each response choice. Percentages do not sum to 100% as respondents could select more the one math class.

3 | Are you using a computer program in math this year?

Yes	No
89.0%	11.0%

Note. The number of respondents for this item was 11,849. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

4 | Which program are you using? If you are using more than one program, please choose the program that you have used the most.

ALEKS	Derivita	DreamBox	Freckle Math	i- Ready	Imagine Math	IXL	Khan Academy	Mathspace
30.5%	3.4%	2.7%	0.2%	35.4%	2.2%	3.2%	0.4%	4.0%

ST Math	Zearn	Other
6.5%	1.0%	10.4%

Note. Only participants who reported using software were asked to respond to this item. The number of respondents was 10,551. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%. Percentages sum to 100%. Among the most frequent "other" responses were Big Ideas Math, DeltaMath, Desmos, and XtraMath. Personalized text piping was used throughout the remainder of the survey such that [math software] was replaced with the name of the software program respondents used.

5| How frequently do you use [math software] at school and at home?

	Never	Once per year	A few times/ year	Once per month	A few times/ month	Once per week	A few times/ week	Daily
At school	1.4%	0.8%	2.5%	1.3%	4.8%	5.9%	29.7%	53.5%
At home	39.9%	2.6%	8.1%	4.8%	12.0%	9.1%	18.0%	5.5%

Note. Only participants who reported using software were asked to respond to this item. The number of respondents ranged from 10,434 to 10,482 across items. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

6 | How much do you agree with these statements about [math software]?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean	Standard Deviation
1. [Math software] helps me improve my confidence in math	5.8%	8.1%	26.3%	42.9%	16.9%	3.57	1.05
2. [Math software] helps me improve my skills in math	4.5%	6.6%	17.5%	47.4%	24.1%	3.80	1.02
3. [Math software] makes math more interesting	15.5%	20.8%	18.8%	22.0%	12.8%	2.96	1.25
4. [Math software] makes math more fun	19.7%	20.8%	27.8%	18.3%	13.4%	2.85	1.30
5. [Math software] helps me see how math is useful in everyday life	11.3%	17.1%	28.7%	29.1%	13.8%	3.17	1.20
6. The work I do in [math software] is too easy	14.6%	30.6%	34.2%	11.7%	8.8%	2.69	1.13
7. The work I do in [math software] is related to the work we are doing in math class	8.6%	12.0%	18.7%	36.3%	24.3%	3.56	1.22
8. I like using [math software]	17.3%	11.7%	25.5%	26.2%	19.4%	3.19	1.35
9. If I have trouble using [math software] when I am at school, I have someone who can help me	9.0%	7.9%	13.7%	35.4%	34.0%	3.77	1.25
10. If I have trouble using [math software] when I am at home, I have someone who can help me	8.5%	12.7%	19.2%	36.0%	23.5%	3.53	1.22
11. I have access to the technology I need to use [math software] at home whenever I need it. Technology may include a computer, a tablet, or a phone and the internet	2.9%	2.5%	8.6%	36.7%	49.3%	4.27	0.93

Note. Only participants who reported using software were asked to respond to these items. In addition, only participants who reported using software at school were asked to respond to item 9 and only participants who reported using software at home were asked to respond to items 10 and 11. The number of respondents ranged from 6,213 to 10,412. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

7 | How much do you agree with these statements about math?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean	Standard Deviation
1. I am good at math	6.5%	8.4%	21.5	38.4	25.3	3.68	1.13
2. Math is fun	16.2%	16.6%	27.0%	23.2%	17.0%	3.08	1.31
3. Math is interesting	12.5%	13.7%	23.7%	31.6%	18.5%	3.30	1.27
4. Math is useful in my daily life	6.6%	8.8%	21.7%	36.6%	26.3%	3.67	1.15
5. Math is hard for me	18.5%	24.3%	28.8%	17.5%	10.9%	2.78	1.24
6. Math is my worst subject	34.5%	25.5%	18.6%	10.7%	10.7%	2.38	1.33
7. When I am older, I might choose a job that uses math	19.5%	16.4%	29.9%	20.9%	13.3%	2.92	1.30
8. I am the type of student who does well in math	8.0%	10.6%	24.6%	34.8%	22.0%	3.52	1.18
9. I can get good grades in math	4.5%	5.2%	17.5%	41.6%	31.2%	3.90	1.04
10. I have a certain amount of ability in math and I can't really do much to change it	16.9%	24.2%	36.0%	15.8%	7.0%	2.72	1.13
11. My confidence in math has improved this year	6.1%	7.9%	21.5%	37.1%	27.3%	3.72	1.13
12 My skills in math have improved this year	4.3%	4.1%	15.2%	40.5%	35.9%	4.00	1.03

Note. The number of respondents ranged from 11,327 to 11,493 across items. Numbers represent the percentage of respondents who selected each response choice. Percentages sum to 100%.

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Appendix

Among survey participants, 1,683 respondents consented to participate, indicated that they taught math, completed at least 20% of the survey, and used a personalized link. Personalized links allowed the UEPC to compare this sample of respondents to the population of teachers who were invited to participate in the survey (n = 16,923) on key teacher-level (Table 1) and student-level (Table 2) characteristics using data available to the UEPC via a Master Data Sharing Agreement with the USBE. As shown, the sample was quite similar to the population. For example, 85% of the teachers who were invited to participate in the survey were female and 86% of this sample of survey respondents were female. Likewise, in both the population and this sample of survey respondents, teachers taught at schools in which, on average, 16% of students qualified for special education services. These comparisons increase our confidence that the results of the current study can be generalized to the population of math teachers in Utah.

Table 1. Comparison of the population of teachers invited to participate in the study and a sample of respondents on key teacher-level characteristics

Variable	Population (n = 16,923)		Sample (n = 1,683)	
	n (%)	mean (SD)	n (%)	mean (SD)
Teacher Race/Ethnicity				
Asian	306 (2%)	--	17 (1%)	--
Black	41 (<1%)	--	3 (<1%)	--
Caucasian	14,532 (86%)	--	1,514 (90%)	--
Hispanic	615 (4%)	--	38 (2%)	--
Native American	68 (<1%)	--	4 (<1%)	--
Pacific Islander	71 (<1%)	--	6 (<1%)	--
Unknown	709 (4%)	--	67 (4%)	--
Missing	581 (3%)	--	34 (2%)	--
Teacher Gender				
Female	14,426 (85%)	--	1,444 (86%)	--
Male	1,903 (11%)	--	205 (12%)	--
Unknown	13 (<1%)	--	0 (<1%)	--
Missing	581 (3%)	--	34 (2%)	--
Teacher Highest Degree Earned				
Doctoral	38 (<1%)	--	6(<1%)	--
Master's	4426 (26%)	--	550(33%)	--
Bachelor's	10211 (60%)	--	986(59%)	--
Missing	2248 (13%)	--	141(8%)	--
Teacher Age	--	42.0 (11.5)	--	44.8 (10.8)

Table 2. Comparison of the population of teachers invited to participate in the study and a sample of respondents on key school-level characteristics

Variable	Population (n = 16,923)		Sample (n = 1,683)	
	n (%)	mean (SD)	n (%)	mean (SD)
Title I school				
Yes	4186 (25%)	--	392 (23%)	--
No	12498 (74%)	--	1274 (76%)	--
Missing	239 (1%)		17 (1%)	--
% of students who were chronically absent	--	29% (14%)	--	28% (14%)
% of Mobile	--	8% (5%)	--	9% (6%)
% Special Ed	--	16% (7%)	--	16% (7%)
% ELL	--	10% (12%)	--	9% (12%)
% Low-Income	--	30% (21%)	--	30% (21%)
% Minority	--	29% (20%)	--	28% (19%)
Enrollment	--	752.9 (468.3)	--	818.7 (541.7)

Note. 118 teachers who were invited to participate in the study taught at more than one school in 2022-2023. For those teachers, school-level values were averaged across schools. For all school-level characteristics, values are based on 2021-2022 student enrollment data for each school as 2022-2023 data were not yet available.