EFFECTIVE MIDDLE GRADE MATHEMATICS

A UTAH LEADING THROUGH EFFECTIVE, ACTIONABLE, AND DYNAMIC EDUCATION

INNOVATIVE PRACTICE REPORT

ULEAD EDUCATION

Emma Eccles Jones
College of Education & Human Services
UtahStateUniversity

ABOUT THIS REPORT

Utah Leading through Effective, Actionable, and Dynamic (ULEAD) Education was created to find, research, and highlight proven practices in Utah schools for replication statewide. ULEAD partners with practitioners, researchers, and education organizations to develop and curate resources, foster collaboration, and drive systemic change for improved student outcomes. The ULEAD Clearinghouse is a growing repository of innovative, effective, and efficient practice resources and tools to support educators.

The ULEAD Steering Committee, composed of current Utah educators and stakeholders, meets quarterly to inform the focus priorities that ULEAD will research. ULEAD uses data to find positive outliers in each focus area and create reports, such as this one, illuminating the practices and policies that lead to positive outcomes. At the time of this report, these priorities include: Student Attendance, Educator Retention and Job Satisfaction, Academic Achievement through Strategic Engagement through Technology, and Academic Success through Social Emotional Supports Grounded in Academic Classroom Practice, with an emphasis on middle grade mathematics and multilingual learner achievement.

This report addresses effective teaching strategies in middle grade mathematics with specific attention to successful teachers at Title 1 schools.

ULEAD collaborates with Institutes of Higher Education and education practitioners to develop Innovative Practice Reports. This report was developed in partnership with Utah State University.

RESEARCHER

Tye Campbell, Ph.D.
Assistant Professor, Utah State University
tye.campbell@usu.edu

Dr. Tye Campbell is an assistant professor in the Teacher Education & Leadership Department at Utah State University. He studies the social, affective, and cognitive factors that promote students' success in mathematics, with an emphasis on middle school mathematics. Dr. Campbell's research has centered around several themes, including: small group learning; mathematical flourishing; teacher noticing; and mathematical argumentation. Through his research, he has uncovered practices that support students to learn and participate productively in mathematics. In addition to research, Dr. Campbell teaches elementary and middle school methods courses to preservice teachers. He enjoys preparing the next generation of teachers to use productive teaching practices that support students' cognitive, affective, and social growth in mathematics.

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Despite the challenges of middle grades, the *teaching practices* that teachers employ have a large influence on students' mathematics achievement.

(Aaronson et al., 2007)

TEACHING PRACTICES

EXECUTIVE SUMMARY

Seven teachers representing five Utah schools across four school districts detailed their mathematical teaching practices through semi-structured interviews.

The practice sites for this study included seven middle grade teachers (Grades 6-8) who taught at Title 1 schools across the state of Utah.

Four of the participants agreed to be identified within this report. Their names, schools, and contact information are provided below. Three other participants chose not to be identified, and therefore, this report preserves their confidentiality.

Rachelle Alvey
Greenwood Elementary
rachellealvey@alpinedistrict.org

Leslie Cecil
Parowan Elementary
leslie.cecil@ironmail.org

Cami Graves,
Greenwood Elementary
camigraves@alpinedistrict.org

Judy Jones
Summit School
judy.jones@ccsdut.org

Analyses of RISE Mathematics assessment data helped identify seven Title 1 middle grade mathematics teachers whose students yielded exceptional growth scores. Campbell (Utah State University) conducted semi-structured interviews with each of the seven teachers to explore the teaching practices that may have contributed to their students' RISE Mathematics student growth percentiles. Based on these interviews, eight themes were constructed:

(1) team planning;

(2) mapping the curriculum;

(3) attending to affect;

(4) direct guidance alongside partner or group reasoning and practice;

(5) whiteboards as student resources;

(6) practicing without over-practicing;

(7) data-driven reteaching;

(8) allowing "redos."

These thematic findings reveal implications for administrators and teachers. Namely, administrators might provide dedicated time for team planning and data-driven intervention, and teachers might implement the instructional practices described within this report in a manner that is most comfortable for them. The primary limitation of this report is that it relies solely on self-report data.

PARTICIPANT IDENTIFICATION

The teachers interviewed in this study were selected through a systematic process. We invited middle-grade teachers from Title 1 schools whose students exhibited the highest growth on the RISE Mathematics assessment to participate. The identification of these teachers was based on the following search parameters:

School years, 2021, 2022, 2023: Taking into consideration student growth over the past three years enhances confidence and reliability, indicating that the teachers consistently achieved high classroom Student Growth Percentiles (SGPs) compared to their peers (Lakens, 2022).

School status, public Title 1 schools: For grades 6-8 in Utah, there is a gap in SGPs between students who are economically disadvantaged and students who are not economically disadvantaged. When comparing these two groups, students who are economically disadvantaged have a student growth percentile that is, on average, four points lower. Title 1 schools have a student population that is comprised of a minimum of 40% low-income students*, so Title 1 status is a proxy for economic disadvantage. Only public schools with Title 1 status were included in the analysis.

Grade level, Grades 6, 7, 8: There is a decline in normalized assessment achievement scores for students transitioning from elementary school to middle school, persisting through 8th grade. Therefore, this grade range is crucial to improving student success (Rockoff & Lockwood, 2010).

Subject area, Math: International comparison studies have established that the relative performance of U.S. students in mathematics declines from elementary school to middle grades (Juvonen, Le, Kaganoff, Augustine, & Constant, 2004). In Utah, math is the subject area in which students demonstrate the lowest proficiency levels.

Assessment, RISE assessment: The RISE assessment is administered annually in Utah to students in grades 3-8 and is the only standardized math assessment administered in Utah to grades 6-8.

Sample size, Class size ≥ 20: Variability diminishes with a larger sample, resulting in more precise and robust results. Moreover, smaller confidence intervals and standard errors enhance the ability to draw conclusions about the true values of the parameters. Lastly, and especially important for ULEAD Innovative Practice Reports, larger sample sizes enhance the generalizability of findings to the broader population. The minimum required sample size was set at 20, as no advanced statistical testing necessitating larger sample sizes was conducted (Andrade, 2020).

Outcome measure, Teacher mean student growth percentile: A student growth percentile (SGP) describes a student's growth compared to their academic peers, who are students with similar prior test scores. SGPs allow us to compare students at different levels. SGPs demonstrate a student's growth and academic progress even if the student is not yet proficient. A student growth percentile is a number between 1 and 99. If a student has an SGP of 80, that means they showed more growth on

*According to the USBE Title I Part A Handbook, "A schoolwide model is available to any school with at least 40% poverty (or to low-performing Title I schools below 40% poverty with a Request to Waive the 40% Poverty Threshold to Operate a Schoolwide Title I School, which, under certain conditions of ESSA, may be issued by the SEA)" (USBE, 2021, p. 8). Under this provision, one of the included schools has a 35% poverty rate.

that subject area assessment than 80 percent of their academic peers. A student with a low score on the RISE assessment can show high growth and a student with a high score can demonstrate low growth. Similarly, two students with different scale scores can have the same SGP (Betebenner, 2011). Prior studies have demonstrated that means are significantly more sensitive and accurate than medians, so that is the descriptive statistic used in this analysis (Castellano & Ho, 2015). The mean SGP for teachers was computed by averaging the SGPs of all students under each teacher in a given school year.

Analysis of outcome measure, Percentile: To qualify for an interview, a teacher needed to exhibit growth at or above the 90th percentile for each of the three school years. This criterion identified teachers in the top 10% of all Title I educators, encompassing the top performers and resulting in a manageable number of interviews.

Ultimately, seven teachers were identified out of the 320 teachers included in the analysis.

DISTRICT & SCHOOL DEMOGRAPHICS

Each of the participating teachers taught at a Title 1 school in Utah. The district and school locations are masked within; however, four participants agreed to be identified and are included in the Executive Summary (page 5). Title 1 designation is given to a school if at least 40% of the school's student population come from low-income households (see note page 6). Thus, the participating teachers taught in schools that served a large population of students coming from low-income households.

	Grades Served	Title 1 Status	Locale	% Racial Minority	% Low Income	% Limited English	% Students with Disabilities
School A1	Pk-6	✓	Suburban - Large	33%	45%	12%	16%
School A2	Pk-6	✓	City - Small	39%	49%	17%	20%
School B	Pk-6	✓	Suburban - Small	16%	35%	6%	16%
School C	Pk-6	✓	Rural - Fringe	14%	51%	1%	18%
School D	7-12	✓	Rural - Fringe	85%	57%	41%	9%

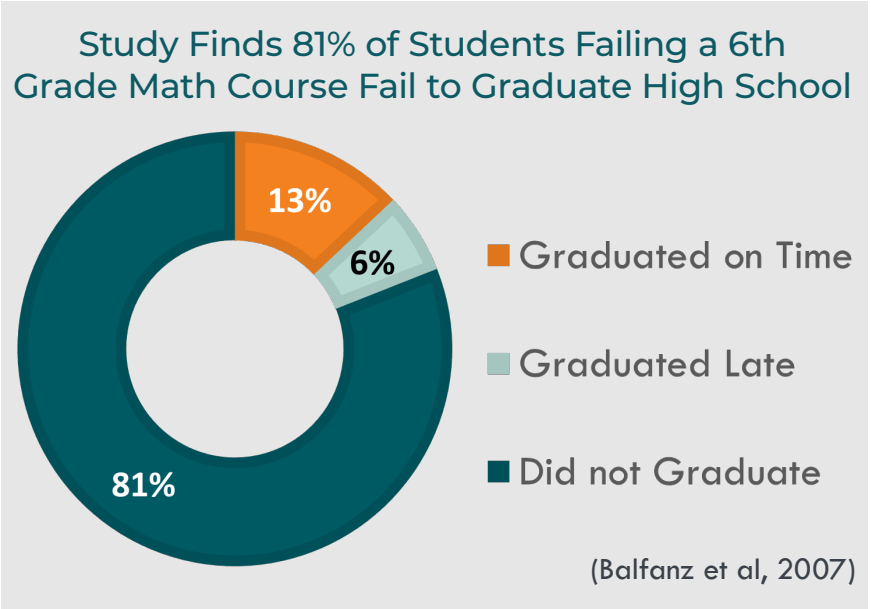
UNDERSTANDING MIDDLE GRADE MATHEMATICS

There is a noticeable "dip" in mathematics performance when students reach middle grades (Hogden et al., 2018; National Mathematics Advisory Panel, 2008; Siemon et al., 2001). This seems to be a global phenomenon, with several countries reporting similar student trajectories. For instance, the National Mathematics Advisory Panel in the U.S. suggested, "The sharp falloff in mathematics achievement in the U.S. begins as students reach late middle school…" (National Mathematics Advisory Panel, 2008, p. xiii). Professional reports in the UK and Australia similarly reveal an attainment dip in middle grades (Hogden et al., 2018; Siemon et al., 2001), with small discrepancies regarding when the dip starts. Thus, students' mathematics achievement is at risk in the middle grades.

Student success in the middle grades can have significant long-term implications as well. A longitudinal study of over 13,000 students over 7 years found that course failure was an even better predictor of graduation than test scores. Specifically, they found only 19% of students that failed 6th grade math graduated within 1 year of on-time graduation (Balfanz et al., 2007). This implies tackling middle grade math achievement will have long-term impacts.

Addressing the "middle school dip" is not an easy task. This is because middle grades mark a critical time of change, both academically and socially. Academically, middle grade students begin to experience more abstract and complex mathematical concepts such as Algebra (National Mathematics Advisory Panel, 2008). At the same time, middle grade students experience significant social challenges when they enter a middle school setting that demands more independence and responsibility (Shoshani & Slone, 2013). Sustaining students' mathematics attainment in the middle grades, therefore, requires extensive support.

Despite the challenges of middle grades, the teaching practices that teachers employ have a large influence on students' mathematics achievement (Aaronson et al., 2007). Teaching practices simply refer to the routines that teachers continually use to support student learning (see Hlas & Hlas, 2012). Teaching practices are broad and can be placed into a variety of categories, including instructional planning, delivering instruction, assessing students, and so on. One reason that teaching is a complex activity is because teachers must simultaneously navigate multiple intricate teaching practices. Scholarship on teaching practices in mathematics has largely focused on how teachers deliver instruction. There has been much debate regarding the most effective delivery methods for promoting students' mathematics achievement across the grades, including middle grades (Munter et al., 2015). While some scholars argue for direct instruction, or instruction that is maximally



guided by the teacher (Clark et al., 2012), other scholars argue for instruction that emphasizes mathematical exploration, problem-solving, and dialogue (Boaler, 2008; Liljedahl, 2020). Still, others argue for mixed approaches that combine direct teacher guidance with mathematical exploration and dialogue. Unfortunately, the research regarding the most effective teaching approaches is contradictory, with studies showing contrasting results (e.g., Boaler, 2008; Stockard et al., 2018).

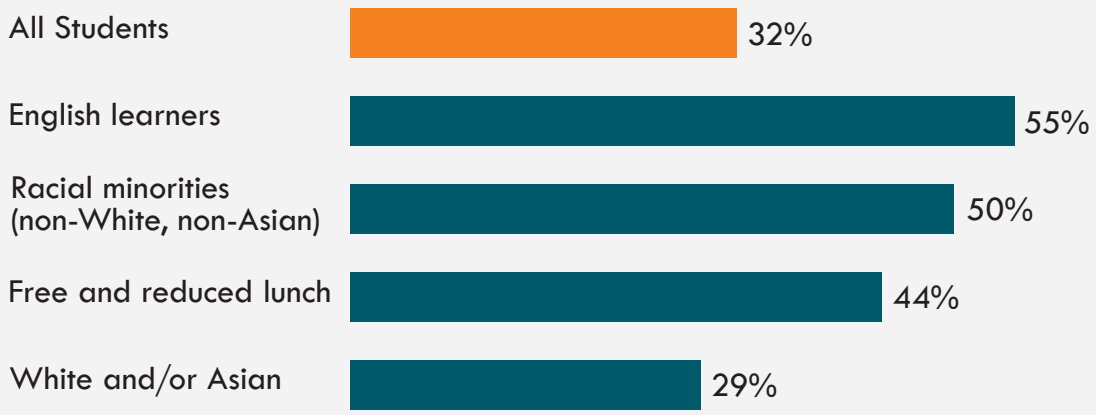
In this practice report, we examine a broad range of teaching practices and their effectiveness from the perspective of expert teachers. These teachers have demonstrated success through students' test scores over a range of three years. We explore how these teachers deliver instruction, and we also explore other pertinent teaching practices such as instructional planning and assessment.

MATHEMATICS IN UTAH

Before discussing the middle grade achievement data in Utah, it is important to thwart any alarmism. Recent assessments reveal that Utah students perform quite well comparative to both national and international counterparts. For example, Utah ranked second amongst all U.S. states on the 2022 National Assessment of Education Progress (NAEP) test that was administered to eighth grade students. Hanushek (2023) compared NAEP data on a similar scale as the 2022 Program for International Student Assessment (PISA), an international achievement test taken by 15-year-old students, and used this comparison to show that Utah may rank competitively on an international scale. These tests do not control for important covariates, but it is worth noting that the state of mathematics education in Utah is not dire.

Notwithstanding recent national assessments, state-level achievement data reveal noteworthy trends in students' mathematics achievement. Each year, Utah students in Grades 3-8 take the RISE Math assessment, which is an assessment that measures students' mathematical achievement according to the Utah Core Mathematics Standards. Data reveal that the percentage of students performing at or above the

Percentage of 5th grade students in Utah who were proficient (2019) in Math on RISE assessment who lost proficiency by 8th grade (2022)



A significant percentage of all 5th grade students who are proficient in Math on the RISE assessment lose proficiency by 8th grade, and some vulnerable subgroups (according to racial minority and free and reduced lunch status) experience the biggest drops.

Data from Utah State Board of Education RISE Proficiency Results

proficient level on the RISE Math assessment tends to decline throughout schooling, with significant deterioration starting in the middle grades (Utah State Board of Education [USBE], 2023). The graph (p. 10) illustrates when tracking Utah students from 5th to 8th grade, there is a larger decline in proficiency for students who are English language learners or in non-White, non-Asian subgroups.

Table 1 shows the percentage of students performing at or above the proficient level on the RISE assessment across the elementary and middle grade bands (3-5; 6-8) for the past three academic school years. As illustrated, the percentage of students scoring at or above proficient declined by seven or more percentage points for each of the last three years. Perhaps more concerning is the significant decline that tends to occur between fifth and sixth grade.

In the 2022-2023 school year, 45% of students scored at or above proficient in fifth grade compared to just 35% of students in sixth grade. These same trends are present in the 2020-2022 and 2021-2022 academic school years. These data indicate that middle grades are a turning point for students' mathematical proficiency.

Table 1. Percentage of Students Performing at or Above Proficient on Rise Math Assessment (USBE, 2023)

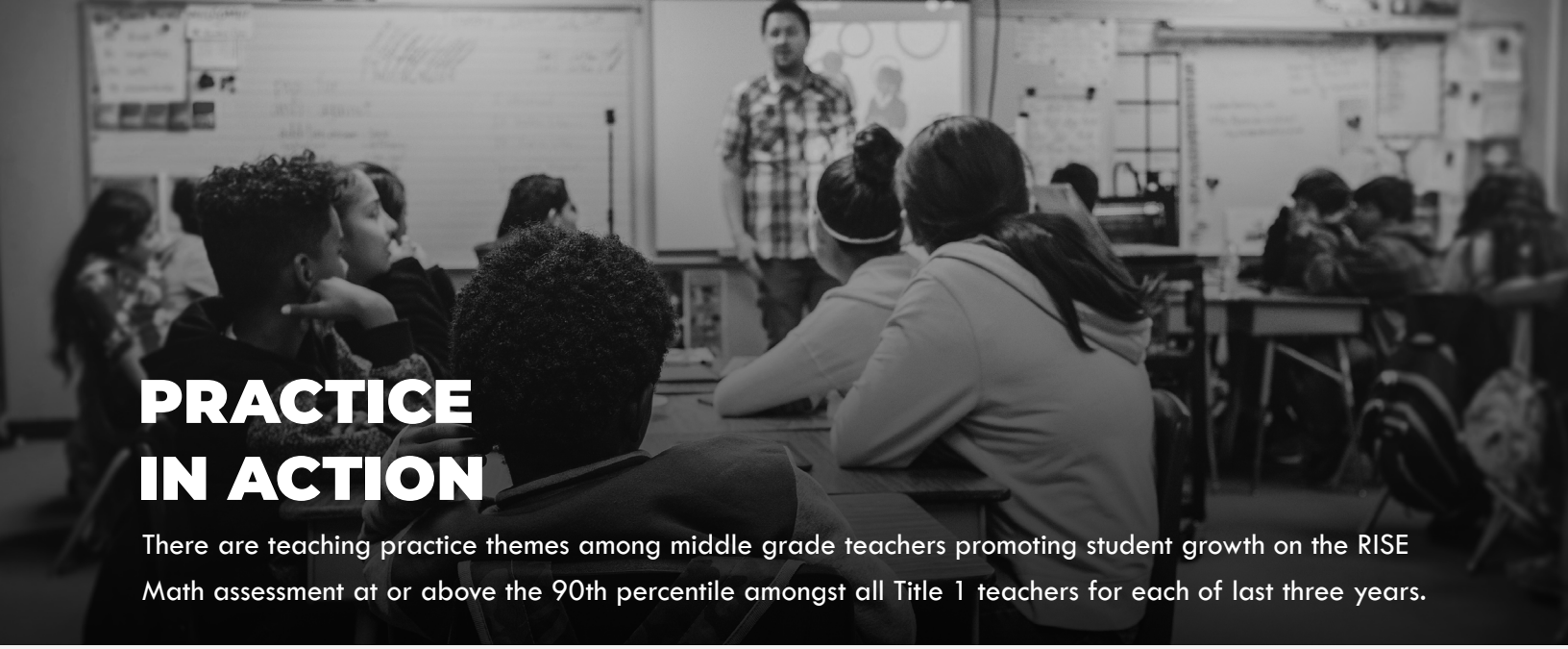
Grade Band	2020-2021	2021-2022	2022-2023
3-5	44%	47%	47%
6-8	37%	39%	34%

In addition to noticeable dips in mathematics performance starting in middle grades for the general population, there is a similar achievement decline for economically disadvantaged students, many of whom attend Title 1 schools. Table 2 shows the percentage of students classified as "economically disadvantaged" by USBE who scored at or above the proficient level across the last three school years.

Table 2. Percentage of Economically Disadvantaged Students Performing at or Above Proficient on RISE Math Assessment (USBE, 2023)

Grade Band	2020-2021	2021-2022	2022-2023
3-5	27%	30%	29%
6-8	21%	22%	22%

Together, the data reveals that all students, and particularly economically disadvantaged students, in Utah need support in overcoming mathematics achievement barriers in the middle grades. Thus, this report provides explicit guidance to educators on how they might support middle grade students to overcome barriers towards exceptional growth in mathematics.



PRACTICE IN ACTION

There are teaching practice themes among middle grade teachers promoting student growth on the RISE Math assessment at or above the 90th percentile amongst all Title 1 teachers for each of last three years.

OBJECTIVES

The objective of this ULEAD report is to document the teaching practices of exceptional middle grade mathematics teachers in Utah who teach in Title 1 schools. This research is needed because current literature and Utah statistics suggest that there is a noticeable dip in mathematical attainment when students reach middle grades, especially for economically disadvantaged students. Thus, uncovering the practices of successful teachers, as evidenced by the data, may support other Title 1 middle grade teachers in promoting mathematics achievement and growth in their own classrooms.

TEACHING PRACTICE

The first author of this report conducted semi-structured 1-hour interviews with seven exceptional teachers (see Participant Identification section). In this section, we describe the practices that the expert teachers reported using within their classrooms—practices that may have promoted achievement growth within their middle grade students. We discuss these practices according to three strands of teaching practice: (1) instructional planning; (2) delivering instruction; (3) assessment.

Instructional Planning

The interviewed teachers expressed two important planning practices: team planning and mapping out the curriculum.

Team Planning

There is an old saying that "two heads are better than one," which means that solving problems and creating unique products is more effective when more than one person is involved. This saying seemed to ring true for the interviewed teachers, as six of the seven teachers reported that team planning was a vital component of their teaching practice.

Team planning simply refers to meeting with a team of teachers on a regular basis to plan instruction. These teachers noted that they met on at least a weekly basis, with some meeting every day. Within these team meetings, teachers planned for future instruction by creating common pedagogical strategies, reflecting on common misconceptions, and exploring students' assessment data. For example, one teacher noted that her team created common assessments during planning and created uniform lessons for each day of instruction. They shared PowerPoint slides and other resources to support one another. This teacher also stated that her team met over lunch each day to discuss the successes and pitfalls of the mathematics lesson for the day. Overall, team planning allowed teachers to create optimal teaching resources.

Mapping the Curriculum

In addition to team planning, teachers suggested that it was important to "map out" the curriculum to align it with state standards, district curriculum guides, and/or RISE assessment topics. Rather than following the scope and sequence of their textbooks, the teachers spent time planning their curriculum

according to the relative weight of each topic as defined by the Utah Core Standards, district curriculum guides, and the RISE assessment. For instance, one sixth-grade teacher noted that ratios and proportion questions were assigned a higher value than some other topics (e.g., statistics) on the RISE assessment. Therefore, this teacher adjusted the scope and sequence of her curriculum to spend more time on ratios and proportions. Some teachers spent time at the beginning of the school year to create an appropriate scope and sequence, while others iteratively planned throughout the school year.

Delivering Instruction

The interviewed teachers reported four unique components of delivering instruction: (1) attending to affect; (2) direct guidance alongside partner/group reasoning and practice; (3) whiteboards as student resources; (4) practicing without over-practicing.

> practices are defined as actions that teachers do habitually or routinely to support learning
>
> (Hlas & Hlas, 2012, p. s78)

Attending to Affect

Four of the seven interviewed teachers reported that they regularly attended to students' affect (i.e., attitudes, moods, emotions) while delivering mathematics instruction. One teacher noted that he talked to his students about building a "growth mindset," or a belief in one's ability to grow through practice and hard work. This teacher stated that he gave quite a few "Ra Ra" motivational talks to his students. Two of the teachers reported that they shared stories about their prior negative experiences with mathematics to encourage students to build confidence in mathematics.

In addition to encouraging a growth mindset, two teachers (both taught in the same school) reported that they conducted daily social emotional check-ins. To do this, they used a Nearpod slide that asks students to rate their emotional wellbeing for the day according to the following scale: (1) I'm great; (2) I'm OK (3) I'm meh; (4) I'm struggling; (5) I'm having a hard time and wouldn't mind a check-in; (6) I'm in a dark space. Student responses can only be seen by the teacher using the Nearpod interface. The teachers took time to check-in with any student who responded (5) or (6) on the social emotional check in.

Overall, many of the teachers attended to students' affect in some way while delivering instruction.

Direct Guidance Alongside Partner/Group Reasoning and Practice

Another primary theme related to delivering instruction was that teachers provided direct guidance alongside partner or group work. While teachers ranged in their instructional style (e.g., Explicit Instruction versus Inquiry Instruction), all teachers provided some type of direct guidance during the lesson. Some teachers provided direct guidance by solving example problems while students watched and/or took notes. Other teachers allowed students to explore problems first followed by providing direct guidance. Thus, all teachers explicitly taught mathematics at some point during the lesson rather than solely allowing students to discover mathematical concepts.

While teachers provided direct guidance to students, they also regularly encouraged students to work with a partner (or group) to reason mathematically or complete practice problems. Some teachers asked students to turn and talk with a neighbor to reason about mathematical ideas/problems throughout the lesson. Other teachers allowed students to work on practice problems at the end of a lesson in collaboration with a partner. In short, the interviewed teachers valued collaboration and frequently promoted it within

their classroom.

Whiteboards as Student Resources
Four of the seven teachers allowed students to use small whiteboards (rather than paper and pencils) to solve problems during mathematics lessons. These teachers mostly allowed students to use whiteboards during the middle of a lesson. For example, the teacher might place a practice problem on the board for students to complete after going over an example together. After students complete the problem on their individual small whiteboards, the teacher can quickly examine students' whiteboards to see how the class is progressing. In this way, whiteboards provide quick feedback to teachers on how the lesson is going. Whiteboards might also provide an engaging alternative to traditional writing surfaces such as paper.

Recent research has suggested that easily erasable surfaces, such as whiteboards, might support students' problem-solving efforts in mathematics (e.g., Liljedahl, 2020). Liljedahl (2020) suggested that students may be more willing to take risks and try something if they can easily erase their work. The interviewed teachers did not explain why they allowed students to use whiteboards or whether they believed it improved student performance. Yet, the fact that four teachers mentioned allowing their students to use whiteboards was notable.

> "... it is clear that non-permanence of surfaces is critical for decreasing time to task, as well as improving enthusiasm, discussion, participation, and persistence."
>
> (Liljedahl, 2016, p. 371)

Practicing without Over-Practicing
All of the interviewed teachers believed that practicing mathematics was important. In fact, every teacher provided time at the end of the lesson for students to complete practice problems that were related to the mathematical objectives of the lesson. Generally, students were given 10-15 minutes to complete these practice problems with a partner (or at least had opportunities to check their answers with a partner). Some teachers assigned homework problems while others did not.

While all teachers believed that practicing mathematics was important, the teachers did not believe in "over-practicing." The teachers provided a reasonable number of practice problems for students to complete. For teachers who assigned homework, they kept the assignment short (i.e., 15 minutes or less). One of the teachers recalled that he had seen teachers provide too many practice problems. This teacher explicitly acknowledged that over-practicing was not productive.

Assessment
The interviewed teachers reported two unique components of assessment: (1) Data-driven reteaching; (2) Allowing "redos."

Data-driven Reteaching
All seven teachers stated that they used data to reteach their students. The teachers varied in the types of data they used and how they organized their reteaching efforts. Some teachers used unit assessment data to create tier 2 intervention groups. Based on students' assessment scores, teachers placed students in similar groupings of approximately six students to receive the help that they needed.

For example, students who scored low on the assessment would be placed in the same group, and they would work with the classroom teacher. The classroom teacher would reteach concepts to improve their mastery. Students who scored in the medium range would be placed in the same group to work with an aide to receive reteaching. Students who showed mastery would be placed in an enrichment group where they could work on challenging problems to extend and enrich their mathematical knowledge.

Rather than using differentiation strategies, some teachers used other methods of reteaching. For example, one teacher used data from the bellringer to inform whether he needed to re-teach. If the class performed well on the bellringer (which was a review problem from the previous day), he moved on to the new lesson. However, if the class did not perform well, then he spent 5-10 minutes reteaching the topic from the prior day. In general, teachers used various data, and continuously retaught students in individual and whole class settings.

Allowing "Redos"

Four out of the seven teachers stated that they allowed students to redo assignments and assessments. Rather than using a rigid grading philosophy, these teachers provided ample opportunities for students to improve their grade (and consequently mastery). One teacher stated that students in her class can "redo anything they want." She acknowledged that it took a lot of time correcting student work by allowing "redos," but she believed that it was worth it.

Another teacher required students to redo their assessments if they did not score above 80%. In this teacher's classroom, students who did not score 80% or better received reteaching followed by another test to assess mastery. In sum, many of the interviewed teachers believed it was important to provide students with multiple chances to prove mastery.

OUTCOMES

RISE Math assessment SGPs over the last three years serve as evidence of the success of the teaching practices described in the this section. The teachers in this report promoted student growth on the RISE Math assessment that ranked at or above the 90th percentile amongst all Title 1 teachers for each of last three years. It is important to note that the practices described within are based on teachers' perceptions and re-telling of their own teaching. Observations and other measures for identifying teaching practices were not included in this report.

SUMMARY OF REPORTED TEACHING PRACTICES

Instructional Planning

- Team Planning
- Mapping Curriculum

Delivering Instruction

- Attending to Affect
- Direct Guidance Alongside Group Reasoning and Practice
- Whiteboards as Student Resources
- Practicing without Over-practicing

Assessment

- Data-driven Reteaching
- Allowing "Redos"

Self-reported successful practices are in alignment with Utah's Pk-12 Mathematics Framework which is designed to:

> provide stakeholders with: An evidence-based framework and self assessment tool to identify strengths and areas of growth, and evidence-based practices that will yield positive mathematical outcomes for students (USBE, 2022, p. 10).

The Five Key Elements that support mathematical outcomes and overviews for each are provided. For a full description of critical indicators see Utah's Pk-12 Mathematics Framework.

Element 1: Instructional Leadership

Instructional Leadership is evident when educators unite to:

- organize resources around a shared, evidence-based vision of student mathematical competency,
- engage in collaborative goal setting, and
- implement and monitor strategies that support local mathematics goals, resulting in student and teacher growth.

Reported Practices

Instructional Planning: Team Planning
Instructional Planning: Mapping the Curriculum
Assessment: Data-driven Reteaching

Element 2: Asset-Based Learning Enviornment

An asset-based learning environment reflects conditions that:

- meets the needs of each student,
- creates a mathematics-rich learning environment for student learning where staff are confident in their roles and relationships,
- promotes a community culture that values trust, respect, and high expectations.

Reported Practices

Delivering Instruction: Attending to Affect
Delivering Instruction: Direct Guidance Alongside Partner/ Group Reasoning and Practice
Assessment: Data-driven Reteaching
Assessment: Allowing "Redos"

Element 3: Instruction and Intervention

Effective instructional practice aimed at improving student-learning outcomes includes:

- strong standards-based instruction,
- data-informed planning,
- differentiation and individualization,
- evidence-based pedagogical approaches, and effective classroom management.

Reported Practices

Instructional Planning: Team Planning
Instructional Planning: Mapping the Curriculum
Delivering Instruction: Direct Guidance Alongside Partner/Group Reasoning and Practice
Delivering Instruction: Whiteboards as Student Resources
Assessment: Data-driven Reteaching

Element 4: Assessment and Feedback

Leaders provide direction and time during the school day for educators to:

- Monitor students' progress to promote student learning and involve students in monitoring their own progress,
- Make evidence-based instructional decisions to modify instruction to facilitate student learning,
- Evaluate students' achievement to summarize and report students' demonstrated understanding at a particular moment in time, and
- Evaluate resources and programs to make decisions about instruction.

(NCTM, 2014, p. 89)

Reported Practices

Instructional Planning: Team Planning
Instructional Planning: Mapping the Curriculum
Delivering Instruction: Whiteboards as Student Resources
Delivering Instruction: Practicing without Over Practicing
Assessment: Data-driven Reteaching
Assessment: Allowing "Redos"

Element 5: Professional Learning

Professional learning is ongoing, high quality, and job-embedded. Learning opportunities are responsive to the site, team, and individual learner needs and are designed to build staff capacity for improvement through:

- coaching,
- mentoring,
- observation (including peer observations), and
- leveraging the effectiveness of high performing teachers, coaches, and leaders by using them as models and peer coaches.

LIMITATIONS & REPLICATION

There are several limitations to this practice report that are important to consider. First, the data gathered in this report were based on self-reporting. It is unclear whether teachers' self-reported teaching practices are consistent with how they actually teach—a limitation of all self-report studies. A more robust study would examine the outlier teachers' practices through observations, self-report, and other measures to provide a more holistic view of their teaching practices.

Second (and relatedly), it is unclear whether the teaching practices that teachers reported actually promoted mathematics achievement growth in their classrooms. There is some level of credibility in that the teaching practices described in this report were common amongst several of the interviewed teachers, but causal relationships cannot be inferred.

Third, this report considered the efficacy of teaching practices based on one outcome measure: student achievement growth on the RISE assessment. One might argue that there are several important outcomes of mathematics education, including mathematical affect, engagement in mathematical practices, building problem-solving skills, and so on. Future studies might identify outlier teachers via multiple desirable outcomes.

Notwithstanding the limitations, the teaching practices described in this study show promise in reproducibility. Teachers can make small changes to their teaching practices, such as using whiteboards, providing a reasonable number of practice problems, engaging in team planning, and so forth. In fact, most of the teaching practices described in this report only require small deviations in teachers' regular classroom practice.

RECOMMENDATIONS & CONCLUSION

We address two populations for the recommendations that follow from this report: administrators and teachers.

ADMINISTRATORS

First, this report may compel administrators to encourage team planning and provide dedicated time for it. Six of the seven interviewed teachers suggested that they regularly engaged in team planning. Unfortunately, many of the teachers had to carve out time outside of traditional business hours. Due to the potential of team planning, it may be prudent for administrators to provide (at least) weekly time allotments for teachers to plan their instruction through lesson plans and assessments.

This report may also compel administrators to ponder how their school might develop robust mathematics intervention strategies. Some schools provide tier 2 intervention time within the regular school day to help students reach mastery. Yet, administrators should also be careful in devoting too much time to mathematics intervention. Students' mathematics-related affect, an important outcome, may deteriorate if schools spend significantly more time on mathematics than other subjects.

TEACHERS

For teachers, we recommend that they give themselves grace in trying out the practices described within this report. It may be prudent for teachers to try one or two strategies at a time instead of trying to implement all of the strategies at once. For example, one simple strategy that could increase engagement immediately is to allow students to write on small whiteboard surfaces (instead of using paper and pencil). Some strategies such as "team planning" and "data-driven reteaching" will require more time and effort to implement.

CONCLUSION

In conclusion, we believe the practices described within this report show promise for improving mathematics assessment growth in Utah, particularly in Title 1 classrooms. Our middle grade mathematics teachers are already working hard and doing great work. We hope this report supports the work that they are already doing toward improved middle grade mathematics achievement.

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ulead@schools.utah.gov

Utah State Board of Education
250 East 500 South | PO Box 144200
Salt Lake City, UT 84114-4200

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