Montana Comprehensive Mathematics Plan

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The Montana Math Plan is intended to be an evolving document. As mathematics systems and practices evolve, so will the information in this document. Please check the Office of Public Instruction website regularly for updates.

MONTANA COMPREHENSIVE MATHEMATICS PLAN

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INTRODUCTION

Montana is a vast, beautiful state with diverse landscapes and populations. It is vital that each of its children, from birth through grade twelve, are afforded the opportunity to develop the mathematical skills needed to be college and career ready. Mathematics instruction is going through a shift in scope and level of understanding. The Common Core Standards are calling for increased understanding within mathematics, as well as maintaining procedural fluency. The changes in the standards for children have led to a change in the way mathematics is taught on a day-to-day basis in schools.

In such a world, those who understand and can do mathematics will have opportunities that others do not. Mathematical competence opens doors to productive futures. A lack of mathematical competence closes those doors. All students deserve an opportunity to understand the power and beauty of mathematics. Students need to learn a new set of mathematical basics that enable them to compute fluently and to solve problems creatively and resourcefully. http://www.nctm.org/standards/content.aspx.

> **Such literate/mathematical thinkers are precisely what employers seek—those who can read, speak, write, and communicate for practical purposes "in the natural and social sciences."**
> (Steen, 2007) as cited in (Schmoker, 2011, p. 203)

The Montana Mathematics Plan provides guidance for schools as they plan for mathematics instruction and assessment. Schools' curriculum must be grounded in the Montana Common Core Standards and delivered with research-based instructional strategies that meet the needs of all learners and encourage the development of positive student mathematics identity.

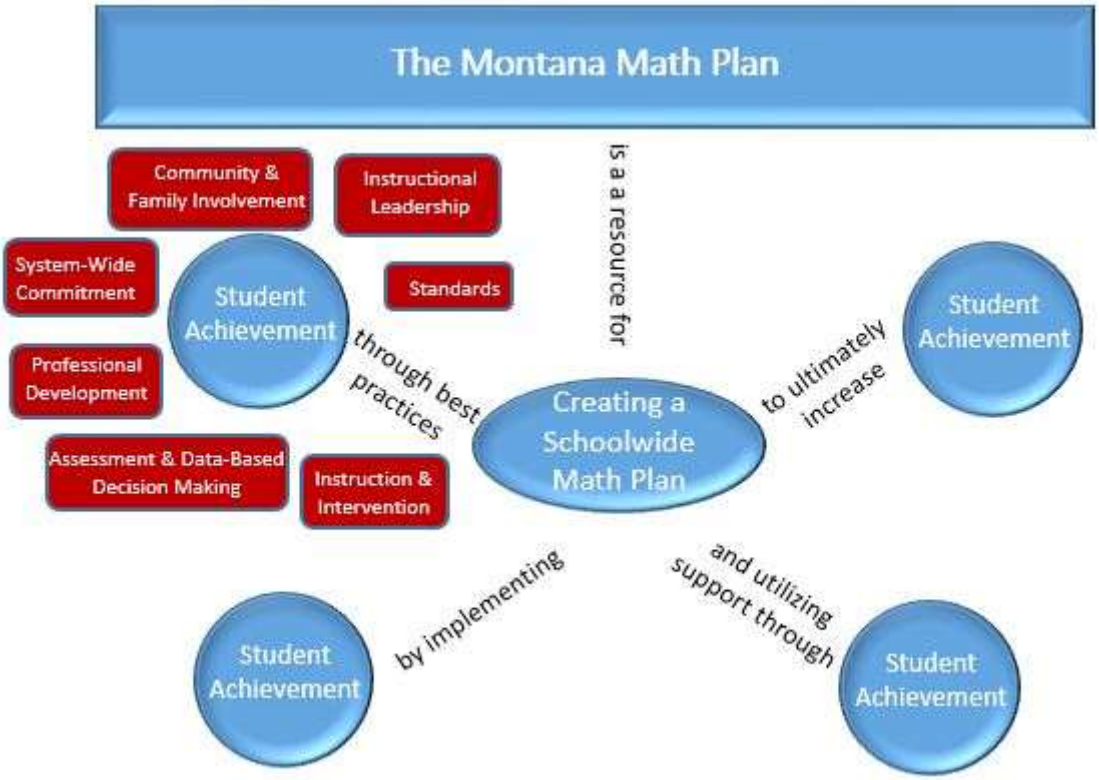
> **Teachers teach within a national culture that for the most part believes in the 'math gene.' … In reality, there is no math gene … Students need to be told–over and over–that being good at math is the result of work … that practice is the key to success.**
> (Confer, C. & Ramirez, M., 2012, pp. 131-132)

The standards for mathematical practice outline the "varieties of expertise that mathematics educators at all levels should seek to develop in their students." (The Montana Office of Public Instruction (OPI), 2011, p. 6) These practices are at the core of what is expected of all students in Montana and should drive instruction within schools. "The Standards for Mathematical Content are a balanced combination of procedure and understanding," (The Montana Office of Public Instruction (OPI), 2011, p. 10) and, when connected to the mathematical practices, bring together the big picture of mathematics instruction.

CONTINUOUS IMPROVEMENT COMPONENTS (CICs)

There are seven Continuous Improvement Components (CICs) that make up the Montana Mathematics Plan. The CICs reflect best practices that are grounded in evidence and the Office of Public Instructions' experience in implementing school improvement initiatives. The CIC are:

1. Instructional Leadership
2. Standards
3. Instruction and Intervention
4. Assessment and Data-based Decision Making
5. Professional Development
6. System-Wide Commitment
7. Community and Family Involvement



INSTRUCTIONAL LEADERSHIP

Defined: A Mathematics Leadership Team (MLT) focuses on helping staff improve mathematics instruction and achievement. Principals (as visible members), co-planners, and co-teachers work side by side with a representational group of staff members to engage and support them becoming leaders committed to improving mathematics. (Confer, C. & Ramirez, M., 2012, p. 21)

Leadership is a key component of any school improvement initiative. The Principal and Mathematics Leadership Team spearhead the school's direction of improvement. "Leadership is the exercise of influence on organization members and diverse stakeholders toward the identification and achievement of the organization's visions and goals." (Leithwood, 2012, p. 1) Continuous improvement of mathematics instruction and student learning is vital in meeting the challenges of the Common Core Standards and preparing students for success.

MLTs are responsible for ensuring the provision of rigorous, standards-based instruction. This requires professional development for staff members with the necessary modeling and support to ensure successful implementation of programming designed to meet the learning needs and standards for students. Fiscal resources must be allocated in order to achieve successful implementation of high quality instruction. This includes, at a minimum: personnel, time, and professional development. Instructional leadership must take into account the needs of personnel and students based upon data from multiple sources, such as student data, the Electronic Self-Assessment for Mathematics, needs assessments, professional development surveys, etc. This provides a data-driven basis to give direction for the allocation of resources and the development of an action plan for targeted professional development.

Establishment of a Mathematics Leadership Team

The success of any improvement initiative in mathematics depends on securing buy-in from teachers and requires selecting staff members to serve on an MLT. This enhances buy-in, as well as building leadership capacity through distribution of responsibility for planning, communicating, and implementing changes within the school. Teacher leaders selected for the MLT should be individuals who:

- have knowledge of best practices for teaching mathematics, including evidence-based mathematics curriculum and mathematics instruction;
- are highly competent in mathematics and recognized by peers for their knowledge and skill in the classroom;
- are willing to share mathematics resources and guide other staff members;
- possess good communication skills;
- are flexible and respect the opinions of others; and
- maintain a positive attitude and can inspire others to do the same.

The MLTs working together to lead school mathematics improvement will create a sustainable improvement cycle, develop and sustain a mathematics culture, and follow and encourage a determined action plan for improving mathematics instruction and student learning.

Three Big Ideas about Leading Improvement in Mathematics

For leaders to encourage improvements in mathematics, three conditions, or "big ideas," assist leadership. Participation by the principal is critical in all activities as he/she is considered the leader of the MLT. (Ontario Leadership Congress, 2013)The three "big ideas" are:

1. Create *the conditions to influence others* to want to know, learn, and engage in what works in the teaching and learning of mathematics, which could also include understanding the "mitigating conditions" associated with classroom practice. (National Institute for School Leadership (NISL), n.d.)
2. *Leader self-efficacy* is the key to success in leading school improvement work in mathematics.
3. Teachers and leaders need to *adopt a "growth mind-set"* for teaching, learning, and leading mathematics.

Big Idea #1: Conditions that Influence Others

Knowledge about classroom conditions with direct effects on student learning can be categorized as:

- technical/rational conditions: knowing and supporting the implementation of powerful teaching strategies;
- emotional conditions: paying attention to teacher emotions and their consequences for classroom practice;
- organizational conditions: building school infrastructure (culture, policies, and operating procedures) that magnify teacher capacity; and
- family conditions: knowing and intervening positively in the impact of family dynamics on student learning.

Big Idea #2: Leader Self-Efficacy

Self-efficacy, believing in one's own ability to perform a task or achieve a goal, is the second Big Idea. Tschannen-Moran and Gareis (Tschannen-Moran, M. and Gareis, C., 2007) studied the antecedents to principal self-efficacy, and their findings included the following:

- School setting, school socioeconomic status, and school level were unrelated to principals' self-efficacy. Even schools thought to be more challenging to manage did not co-relate differently than less challenging schools to principals' self-efficacy.
- Having positive role models similar to oneself can provide vicarious experiences that influence self-efficacy beliefs.
- There was no significant relationship between years of experience and principals' self-efficacy; experience alone was not the best teacher. It matters more that principals' shape and process experiences in ways that lead to more effective strategies.
- District-level support made a significant contribution to principals' self-efficacy.
- Bottom-up support from those whom the principals lead (teachers and staff) and whom the principals serve (students and parents) matters.

(Tschannen-Moran, M. & Tschannen-Moran, B., 2011)

Big Idea #3: Adopt a Growth Mind-Set

Educational leaders need to send messages that intelligence is fluid and to hear such messages, as well. The need is to keep growing, especially in challenging and changing times. Only in growth mind-set cultures, where teachers and principals are encouraged to fulfill their potential, will they be able to help students fulfill their potential in schools. Some examples:

- We believe in your potential and are committed to helping everyone get smarter.
- We value (and praise) taking on challenges, exerting effort, and surmounting obstacles more than we value (and praise) "natural" talent and easy success.
- Working hard to learn new things makes you smarter; it makes your brain grown new connections.
- School is not a place that judges you. It is a place where people help your brain grow new connections. (Dweck, 2010, p. 28)

Communication as a Shared Responsibility

Throughout National Institute for School Leadership training, clear, meaningful communication is considered key to maintaining the focus of improvement activities on a common, shared vision. Leadership is responsible for conveying and safeguarding this common vision. Such emphasis assists the establishment of a culture of distributed leadership where "multiple sources of guidance and direction" ensure all voices are valued and heard, as well as shared responsibility for "a common frame of values of how to approach a task." (Elmore, Building New Struture of School Leadership, 2000) Common or shared responsibility emphasizes and improves communication. Also, a culture of common responsibility grows as leadership participates in mathematics improvement as both co-planner and co-teacher of mathematics.

> **When teachers and coaches intentionally involve the principal in planning sessions, the principal will grow in his or her knowledge of mathematics and instruction, and will be more likely to share in the responsibility for the outcomes of that plan.** (Confer, C. & Ramirez, M., 2012, p. 133)

It is vital for leadership, including members of distributed leadership, to responsibly communicate the action planning activities of the MLT to all staff and other stakeholders.

> **Part of the distributed leadership actions of the Leadership Team is to "Communicate goals to staff and formally and informally keep them in the forefront of the conversations about student achievement.** (Marzano, R.J., Waters, T., & McNulty, B.A., 2005, p. 108)

The principal should offer timely, meaningful feedback from walkthrough observations, both formal and evaluative. Principals need to provide opportunities for both the MLT and all staff to participate in observational rounds for the benefits derived from observing master teachers at work in authentic classroom settings. (Rissman, L. M., Miller, D. H., & Torgesen, J. K., 2009)

Instruction and Intervention Expectations

A significant amount of educational research is centered on instructional leadership interpreting best practices in high-performing school districts. Instructional leadership understands best practices and plans implementation of those practices.

Defined: Best practices are defined as a coherent system of practices that can be easily observed, described, and replicated and are tied to characteristics of effective, high-performing schools.

Principals, coaches, peers, or members of the MTL actively involved in the instruction within classrooms have a positive impact on the overall mathematics program for the students. We can learn from effective practices within the area of literacy to improve programming within mathematics, but must keep an eye on those aspects of teaching mathematics that are unique to the discipline, i.e., open-mindedness to multiple solutions, less abstraction and more "hands-on" techniques, discipline specific vocabulary, explanatory writing, etc.

For more information, see the section on *Instruction and Intervention*.

Principals

("A Guide to Effective Instruction in Mathematics," Volume One, 2006)

> **As instructional leader of your school, you must support the efforts of all teachers to promote students' mathematical skills. You can help by providing resources and time for teachers to build their skills, discuss what works, and collaborate in a school-wide effort to increase the ability of all students to achieve mathematically.** (NAEP, 2002)

To further support the efforts of the classroom teachers, leadership needs a deep understanding of the planning and implementation of lessons that come from direct classroom experience as co-planners and co-teachers. (Confer, C. & Ramirez, M., 2012, pp. 47-48)

Principals can lead school-wide mathematics improvement by means of some or all of the following list of roles.

Distributed Leadership

Distributed leadership is critical to success in school improvement efforts. "[T]he knowledge base one must have to provide guidance on curriculum, instruction, and assessment is vast. Elmore's solution is an organization that distributes the responsibility for leadership." (Marzano, R.J., Waters, T., & McNulty, B.A., 2005, pp. 21-22)

> **Distributed leadership, then, means multiple sources of guidance and direction, following the contours of expertise in an organization, made coherent through a common culture.** (Elmore, Building New Struture of School Leadership, 2000, p. 15)

The principal, however, cannot delegate his/her role or responsibility. School improvement efforts "… can be considered the joint work of the leadership team, with the principal functioning as a key member of that team." (Marzano, R.J., Waters, T., & McNulty, B.A., 2005, p. 106)

Not only do principals bring together the assistance of and give voice to their knowledgeable, experienced staff through the MLT, but distribute leadership in the form of the MLT that allows for the building of leadership capacity within that staff. Therefore, distributed leadership is highly recommended for:

- mathematics initiatives and encouraging the development of in-school leaders;
- Developing clear, measurable goals for professional learning that are data-based and aligned with the school's goals for improving the level of student achievement;
- promoting in-school mathematics partnerships and learning teams by becoming a co-planner and co-teacher with staff to assist in establishing both a mathematics culture within the school and buy-in from staff and students (Confer, C. & Ramirez, M., 2012, pp. 47-48);
- principal observing classes regularly and offering teachers encouragement and constructive feedback about their professional learning aligned with mathematics walkthrough criteria; and
- encouraging all staff to participate in instructional rounds for professional growth goals and opportunities.

Professional Learning

There is a shift in roles when capitalizing on distributed leadership and partnering with staff through an MLT. This shift can determine changes for professional learning and growth to build instructional capacity and leadership capacity. It is evident through collaboration with an MLT that "anyone at the school can be the catalyst for any other person's professional growth."

(Confer, C. & Ramirez, M., 2012, p. 50)

There is a deep need to fill gaps between what leaders and teachers are expected to do and what type and quality professional development they receive, as well as bringing training into classrooms.

> **The knowledge gap, then, is not so much about knowing what good professional development looks like; it's about knowing how to get it rooted in the institutional structure of the schools … more explicit guidance about how to bring these more enlightened practices into the mainstream of school life.**
>
> (Elmore, "Bridging the Gap between Standards and Achievement", 2002, p. 11)

It is suggested that professional learning be targeted for:

- enhancing the capacity for leadership in mathematics by participating in professional learning activities with their peers and with superintendents;
- coordinating training and other learning opportunities that are data-based and in keeping with the school's vision and goals;
- promoting and participating in in-school mathematics partnerships and learning teams by the principal who "periodically plans lessons, co-teaches lessons, modifies his or her own practices,

shares new learning with others, and leads professional development based on research" (Confer, C. & Ramirez, M., 2012, p. 50);

- ascertaining the needs of staff and students and then targeting funds, resources, and time;
- incorporating current knowledge derived from research on mathematics instruction into staff professional learning activities, and
- principals participating in these activities with staff to:
  - promote consistency in the interpretation of information;
  - demonstrate the value placed on professional learning; and
  - encourage the development of a mathematics culture within the school.

Monitor and Review Regularly

Montana has an opportunity to regularly monitor and provide meaningful feedback in a growth model format through the use of the Educator Performance Appraisal System (EPAS), designed for both principals and teachers.

> **As of July 1, 2013, Administrative Rules of Montana (ARM) Chapter 55 Standards of Accreditation Revised are in effect. Included in Chapter 55 are the revised standards relating to the evaluation process used in Montana schools, which outline the minimum guidelines and requirements of "the evaluation system used by a school district."**
>
> (The Montana Office of Public Instruction, 2015)

Designed as a professional growth model, EPAS is a natural springboard into monitoring and reviewing administrative roles in developing and implementing vision and goals, a culture of learning, the management of learning, and professional responsibilities. Further, it opens learning conversations regarding teaching planning and preparation, classroom environment, instructional effectiveness for student learning, and professional responsibilities for teachers.

For principals, the EPAS growth model allows for:

- identifying and encouraging exemplary practices and leadership by school staff, providing consistent, constructive, and supportive feedback on improvement efforts, and encouraging reflection;
- monitoring, participating in, and regularly reviewing with staff the implementation process for their school's mathematics improvement and professional learning plans;
- using, and ensuring that others use, data from assessments as the basis for instructional, structural, and resource-allocation decisions; and
- choosing topics for mathematics meetings that support the school's learning priorities based on data.

Time Commitment

Time is a precious commodity for anyone in education, and the most time should be allotted to the important things, especially in terms of activities for school improvement.

> **The key is not to prioritize what's on your schedule, but to schedule your priorities.**
> (Confer, C. & Ramirez, M., 2012, p. 59)

A cost benefit analysis can often assist leadership to understand that:

> **The cost is what educators give up in order to do something. The benefit is the long-term or short-term payoff in relation to the school's primary goal–in this instance, improvement of student understanding and achievement in mathematics.**
> (Confer, C. & Ramirez, M., 2012, p. 60)

Time consideration is recommended for school improvement in mathematics for:

- structuring schools' schedule to provide uninterrupted blocks of time for mathematics instruction;
- promoting creative use of in-school release time for grade-level and cross-grade planning and focused discussions among teachers about student work and about the steps required to address areas of need;
- consider the 80/20 rule: Spend 80 percent of time, energy, and money on the things that matter most and 20 percent on the things that have less payoff in a cost/benefit analysis of issues regarding mathematics improvement. (Confer, C. & Ramirez, M., 2012, p. 61)

Importance of Walkthrough Observations

Walkthrough observations conducted by the principal and staff participating in instructional rounds opportunities are both vital to instructional improvement. Mathematics as a discipline has its own specific elements of effective instruction. Instructional best practices cannot be transposed from other disciplines into the mathematics classroom with expected results.

> **The content area of mathematics compels educators to pry open the lid of that chest full of years-old patterns of instruction, to sift through them and examine them, using a new and perhaps unfamiliar lens.** (Confer, C. & Ramirez, M., 2012, p. 112)

What we are to observe in the mathematics setting to meet the specifics of mathematics instruction? There is a *shift in culture, as well as instruction,* within the mathematical setting that include effective patterns of instruction and shifts in thinking. Research by Ash and D'Auria indicate that "individual and collective beliefs and mindsets are key determinants of instructional practice and classroom environments." (NCSM, 2014, p. 12)

> **We know that good patterns of instruction improve the likelihood that learning will come to rest in students' long-term memories rather than flit into short-term memory and then escape. … What are these patterns of instruction?** (Confer, C. & Ramirez, M., 2012, p. 112)

For walkthroughs to provide information and data culminating in meaningful, authentic feedback, leaders need to know what to look for in a mathematics classroom. (See the section on Instruction and

Intervention for the Instructional Process for details.) Research has shown that regular classroom observations by principals and MLT, combined with meaningful dialogue, data analysis, and high-quality professional development, can have a positive impact on instructional quality and student achievement in literacy. Further, *Adolescent Literacy Walk-Through for Principals* (Rissman, L. M., Miller, D. H., & Torgesen, J. K., 2009) identifies four models of classroom walk-throughs:

1. The Three-Minute Classroom Walk-Through: Designed for conducting short, focused observations on curriculum and instruction with a goal of reflective conversation with teachers that leads to professional growth.
2. Three Cs and an E: Designed for conducting walkthroughs looking for *curriculum* content being taught, level of expected *cognitive* ability according to Bloom's taxonomy, *classroom* and lesson context, and *evidence* of student engagement. Staff receives feedback that encourages them to think deeply about their teaching. The outcome is a snapshot that informs instructional leadership of the demands and challenges of classrooms.
3. Data Analysis by Walking Around: Designed for a team consisting of teachers, principals, parents, and educators that form a district-wide focus on expectations for learning and linking classroom practice to what students are expected to learn. The team looks for specific evidence to support the expectations.
4. Data in a Day: Designed for 25-minute classroom observations four times a year that focus on five categories: instructional practices, engagement, levels of thinking, the connection between the teaching and curriculum standards, and the classroom climate. The categories are explicitly defined so that team members can note occurrences with some degree of fidelity.

Within these models for walkthroughs based on effective patterns of mathematics instruction, what evidence of effective *mathematics* instruction should leaders look for during classrooms walkthroughs?

While much walkthrough evidence is readily observable, other evidence of best instructional practice is not readily observed. Recognizing this, EPAS includes two domains that are considered hidden: "Planning and Preparation" and "Professional Responsibilities."

Confer and Ramirez suggest, and are supported by other research, (NCSM, 2014, p. 30) that effective mathematics instruction includes evidence of the following items, although they may not address the "hidden" aspects of effective instruction found in planning or other professional responsibilities EPAS deems important. A section on the "hidden" evidence will follow. The school should design a walkthrough form to address specific instructional best practices the school determines to be beneficial to their students' needs aligned with research-based suggested practices.

Observable Evidence

Were you able to find evidence that:

- The lesson content aligns with the Common Core Standards within the lesson objective and that the rigor or complexity is maintained?
- Mathematics is visible and not just an abstraction?
- Student thinking is brought to the forefront, even if wrong, as these moments are opportunities to learn?

- There is a rich mathematics environment and appropriately used mathematics vocabulary?
- Powerful, predictable patterns for lessons are used, such as introduction, investigation, and then discussion and processing?
- There is use of effective strategies to keep students actively engaged in hands-on, experiential activities that are less abstract? (Steen, 2007) as cited in (Confer, C. & Ramirez, M., 2012, p. 202)
- Deep learning depended on the "interplay of numbers and words, especially on expressing quantitative relationships in meaningful sentences"? (Ibid)
- Students are encouraged to talk and are actively engaged in discussions of alternative methods, analysis, and solutions? (Confer, C. & Ramirez, M., 2012, pp. 113-125)
- Students are writing to explain their thinking, learning, processes and solutions in mathematics?

> **When students are asked to explain or evaluate a solution or algorithm in writing, they come to a clearer, deeper understanding of a formula's meaning and application.** (Schmoker, 2011, p. 211)
>
> **Writing may be among the most vital but missing ingredient(s) in current math education."** (Ibid, p. 212)

Invisible or "Hidden" Evidence

Domain 1 and 4 are considered "hidden" domains that are not explicitly observable in a lesson, but they impact the quality of instruction and, therefore, students' learning experience. According to Danielson, in Domain 1, instructional design describes "… how a teacher organizes the content students are supposed to learn …" (Danielson, et al., 2009, p. 21)While evidence of planning may be recognized in instruction as it is presented, some of it remains "hidden," such as the depth of knowledge a teacher possesses, including the prerequisite knowledge a student must have, knowledge of resources available for use, or setting instructional outcomes. Others may include the teacher's understanding of students' needs, including special-needs students and English language learners. All elements of the process involved in planning and preparing to teach a lesson may not be explicitly observable.

Domain 4, regarding Professional Responsibilities, may not be explicitly observable during a lesson, but definitely impact the quality of instruction students receive and, therefore, their learning. They are considered hallmarks of a "true professional educator." (Danielson, et al., 2009, p. 377) Domain 4 includes concepts that are learned on the job as part of being a responsible educator, such as maintaining accurate student records; or they may be for more seasoned educators, such as participating in a professional community. These activities extend beyond the classroom and are indicators of their engagement as a professional.

For more information on the 4 Domains of the Danielson model, please see the Montana Office of Public Instruction website's Accreditation and Educator Preparation Program for the EPAS.

Measurable Goals for Academic Improvement

Any initiative for improvement needs to have clear goals. Instructional leaders must also make certain that time for literacy instruction during the day is a priority and that instructional materials are readily available for all instruction and intervention settings.

Using Student Achievement Data to Support Instructional Decision Making (Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., & Wayman, J., 2009) recommends making data part of an ongoing cycle of instructional improvement. There are three steps for effectively carrying out this recommendation:

1. Collect and prepare a variety of data about student learning.
2. Interpret data and develop hypotheses about how to improve student learning.
3. Modify instruction to test hypothesis and increase student learning.

After forming hypothesis, teachers may choose to implement one or more of the following actions identified:

- Allocate more time for topics with which students are struggling.
- Reorder the curriculum to shore up essential skills with which students are struggling.
- Designate particular students to receive additional help with particular skills.
- Attempt new ways of teaching difficult or complex concepts, especially based on best practices identified by teaching colleagues.
- Better alignment of performance expectations among classrooms or between grade levels.
- Better alignment of curriculum emphasis among grade levels.

Analysis of School and Student Data

Using Student Achievement Data to Support Instructional Decision Making (Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., & Wayman, J., 2009) recommends establishing a clear vision for school-wide data use. Analyzing school-wide data is an activity of the MLT in regard to specific improvement goals being addressed with the bottom line always in reference to student achievement. There are four steps for effectively carrying out this recommendation:

1. Establish a school-wide data team that sets the tone for ongoing data use.
    - Team members of the data team should clarify the school's data vision and model the use of data to make instructional decisions, and encourage other school staff to do the same.
2. Define critical teaching and learning concepts.
    - Team members need to identify and define a common vocabulary related to data use, in particular, to minimize conflicted assumptions and misunderstandings. Focus on words like achievement, collaboration, data, evidence, progress, and benchmarks.
3. Develop a written plan that articulates activities, roles, and responsibilities.
    - Team members should create a written plan that clearly articulates the use of data in achieving goals and ensuring that they are:
        - attainable, in that they are realistic, given existing performance levels;
        - measurable, in that they clearly express the parameters of achievement and can be supported by data; and

    - relevant, in that they take into account the specific culture and constraints of the school.
4. Provide ongoing data leadership.
    - Team members should provide support for all staff on how the plan of using data supports the school's vision. Team members can educate staff by having individual or small group meetings focused on these topics:
        - providing resources and support for data analysis and interpretation;
        - encouraging educators to use data in their daily work;
        - creating incentives to motivate staff to analyze data; and
        - participating in grade and subject level meetings to ensure that structured collaboration time is used effectively.

Collaboration among Staff

A collaborative culture is created by providing time for staff members to learn, discuss, and reflect on literacy achievement and instruction within the regular school day. Staff members collaborate in a variety of teams, including grade level, department, special education, and general education. The principal works collaboratively with the teams to continually make data-driven decisions for improving literacy achievement.

The *Louisiana's Comprehensive Literacy Plan* (Louisiana Department of Education, 2011, p. 6) identifies key questions teams are charged with in exploring, implementing, and ultimately sustaining:

- What do students need to know and be able to do?
- How are the concepts and skills to be taught, with what strategies and resources?
- What do the data show about students' learning?
- What steps need to be taken (e.g., adjustment in instruction) when students do not reach proficiency?
- What professional development must staff engage in to increase student learning?

High-performing schools are characterized by the following Instructional Leadership Continuous Literacy Improvement Subcomponents. (See Appendix A, for complete Self-Assessment.)

Instructional Leadership					
←	1 Exploring	2 Beginning to be Implemented	3 Implementing	4 Beginning to be Sustained	5 Sustaining →
1.	Instructional leaders support and monitor all instruction and intervention expectations.				1 2 3 4 5
2.	Instructional leaders have established measurable goals for academic improvement that explicitly align to the Montana Common Core Standards and monitor progress toward these goals.				1 2 3 4 5
3.	Instructional leaders meet regularly to analyze school and student data to inform and convey decisions about professional development, instruction, and intervention.				1 2 3 4 5
4.	Instructional leaders communicate a shared responsibility for student mathematics outcomes.				1 2 3 4 5
5.	Instructional leaders engage leaders across the school community in continuous mathematics improvement planning.				1 2 3 4 5
6.	Adequate fiscal resources are provided to support mathematics improvement efforts.				1 2 3 4 5
7.	Instructional leaders establish, support, and lead a mathematics leadership team.				1 2 3 4 5
8.	Instructional leaders have established a culture of collaboration among staff with a focus on mathematics achievement and effective mathematics instruction.				1 2 3 4 5
Action Ideas for Leadership:					

Instructional Leadership Summary

As instructional leaders of your school, you must support the efforts of all teachers to promote students' mathematical skills. You can help by providing resources and time for teachers to build their skills, discuss what works, and collaborate in a school-wide effort to increase the ability of all students to achieve mathematically. (NAEP, 2002)

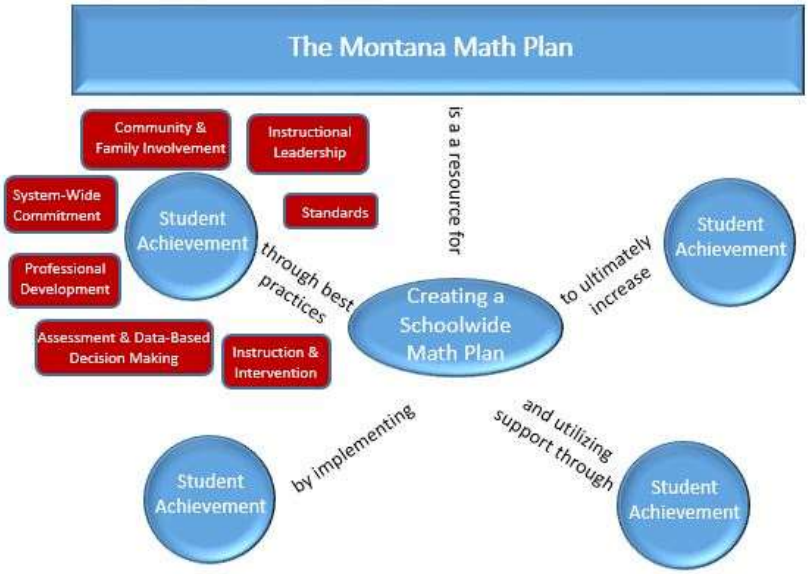
Establishment of an Instructional Leadership Team

Defined*:* An Instructional Leadership Team (ILT) focuses on helping staff improve instruction and achievement. Administrators, as visible members, work side by side with a representational group of staff members to engage and support them in becoming leaders committed to improving mathematics.

The success of any improvement initiative depends on securing buy-in from teachers and requires selecting staff members to serve on an ILT who:

- have knowledge of best practices, including evidence-based curriculum and instruction;
- are highly competent and recognized by peers for their knowledge and skill in the classroom;
- are willing to share resources and guide other staff members;
- possess good communication skills;
- are flexible and respect the opinions of others; and
- maintain a positive attitude and can inspire others to do the same.

The leadership teams work as a group to lead school improvement that will create a sustainable culture of improving instruction and student learning.



Vision–Understand where you are and where you want to go:

- Establish a schoolwide data team that sets the tone for ongoing data use.
    - Team members of the data team should clarify the school's data vision and model the use of data to make instructional decisions and encourage other school staff to do the same.
- Use, and ensure that others use, assessment results as the basis for instructional, structural, and resource-allocation decisions.
- Develop, in collaboration with staff, SMART goals (Specific, Measurable, Attainable, Relevant, Time-based) for professional learning that are aligned with the school's goals for improving the level of student achievement.
- Ascertain the needs of staff and students and allocate the appropriate funds, human resources, and time for in-school teacher learning.

Structure–Tangible elements for instructional leaders that aid math instruction:

- Distributing leadership for math initiatives and encouraging the development of in-school leaders.
- Incorporating current knowledge derived from research on mathematics instruction into staff professional learning activities.
- Enhancing their own capacity for leadership in mathematics by participating in professional learning.
- Coordinating the provision of internal and external supports, including training and other learning opportunities aligned with the school's vision.
- Promoting in-school mathematics partnerships and learning teams.
- Structuring their schools' schedule to provide uninterrupted blocks of time for mathematics instruction.
- Promoting creative use of in-school release time for grade-level and cross-grade planning and focused discussions among teachers about student work and about the steps required to address areas of need.
- Requiring vertical and horizontal alignment of the mathematics curriculum.
- Choosing topics for mathematics meetings that support the school's learning priorities.

Support–Intangible elements for instructional leaders that aid instruction:

- Educational leaders need to send messages that intelligence is fluid, and they need to hear such messages, too.
- Identify and encourage exemplary practices and leadership by school staff, providing consistent, constructive, and supportive feedback on improvement efforts and encouraging reflection.
- Monitor and regularly review with staff the implementation process for their schools' mathematics improvement and professional learning plans.
- Observe classes regularly and offer teachers encouragement and constructive feedback about their professional learning.

STANDARDS

Standards Overview

Defined: Guskey and Bailey define standards in education as the goals of teaching and learning. They describe precisely what we want students to know and be able to do as a result of their experiences in school. (Guskey, T. R. & Bailey, J. M., 2010) Standards specify the particular knowledge, skills, abilities, and positions that we hope students will gain through interactions with teachers and fellow students in school learning environments. Educational standards help teachers ensure their students have the knowledge they need to be successful by providing clear goals for student learning. (Common Core State Standards Initiative, 2012)

The Montana Common Core Standards (MCCS) are designed to guide what students need to know and be able to do in order to provide guidance for "a guaranteed and viable curriculum." (Marzano, 2003) as cited in (Schmoker, 2011, p. 10) To achieve such a curriculum requires thoughtful selection of the essential standards to be taught and to "teach the essential standards in sufficient intellectual depth." (Schmoker, 2011, p. 10). The standards to be considered at a school should be "… the standards that are *actually taught … and should* not be excessive ..." accounting for "… about half of what is contained in our standards documents." (Ainsworth, 2003) as cited in (Schmoker, 2011, p. 10)

The Common Core Standards and the mathematical practices together form the big picture of mathematics instruction. The math standards provide clarity and specificity rather than broad general statements. (The Montana Office of Public Instruction (OPI), 2011); (Common Core State Standards Initiative, 2012)

Mathematics Standards are Different

How are the standards different?

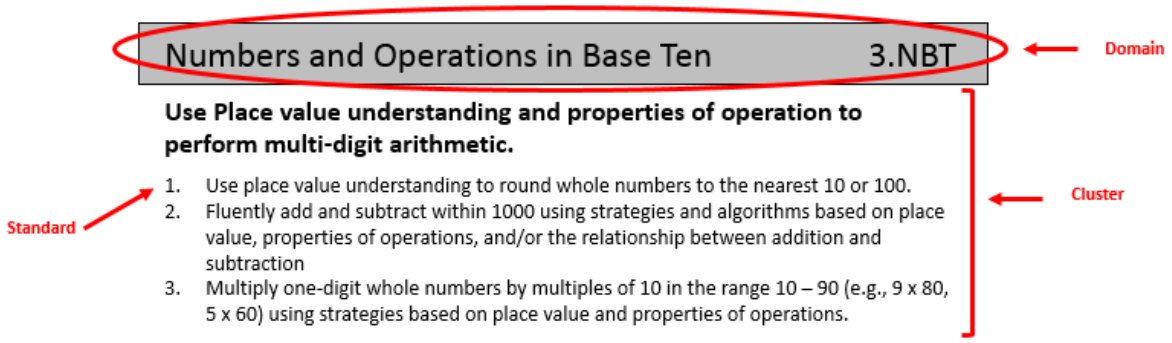
- Focus: Each grade level focuses on fewer topics.
- Coherence: The standards link topics and thinking across grade levels.
- Rigor: The new standards pursue conceptual understanding (why the math works), procedural skills and fluency (knowing the steps and math facts), and application (using the math in the real world) with equal intensity.

The development of the Mathematics Standards began with research-based learning progressions detailing what is known today about how students' mathematical knowledge, skill, and understanding developed over time. The knowledge and skills students need to be prepared for mathematics in college, career, and life are woven throughout the mathematics standards.

Reading the standards for mathematics requires an understanding of Standards, Clusters, and Domains. They do not include separate Anchor Standards like those used in the ELA/literacy standards. (Confrey, 2007) as cited in (Common Core State Standards Initiative, 2012)

Standards	Define what students should be able to understand and be able to do
Clusters	Summarize groups of related standards
Domains	Larger groups of related standards

As an example,



More information about how the standards are tied together can be found at http://achievethecore.org/coherence-map/.

Standards of Mathematical Practice

The Standards for Mathematical Practice, also known as the 8 Mathematical Practices (8MP), are the only standards that pertain to every grade level. They are a set of goals that a teacher should strive to reach regardless of which content standard they are teaching. A teacher that stands in front of the class and does all of the talking probably isn't reaching many of the 8MP in their lesson. Students should:

8MPs	In the classroom…
1. Make sense of problems and persevere in solving them	The teacher facilitates the lesson so students are given the opportunity to take ownership in problem solving. Instead of being given answers, students are encouraged to work with peers to solve a problem and to check their solution for accuracy and plausibility.
2. Reason abstractly and quantitatively	The teacher provides the opportunity for students to look at a contextual situation and discern the mathematics that apply to that situation (or vice versa). The students become proficient at understanding and performing multiple ways to find solutions.
3. Construct viable arguments and critique the reasoning of others	The teacher creates and facilitates a positive learning environment where students work through challenging problems with multiple solutions. The students are given the opportunity to critique other's work and defend their own solutions. The students come to understand that the critique is about learning mathematical ideas and not a judgment about the person who is sharing their ideas. Document cameras are a great tool for this.

4. Model with mathematics	Teachers provide rich mathematical modeling situations for students to collect data about real world phenomenon. The students use the data and their prior experiences to draw conclusions and verify the results.
5. **Use appropriate tools strategically**	The teacher provides access to mathematical tools and trains the students how to use the tools efficiently and effectively. When faced with a problem, students will select and use the appropriate tool or tools to solve the problem.
6. Attend to precision	The teacher models and holds students accountable for using mathematical vocabulary and symbolism appropriately. Teachers hold students accountable for labeling their units and titling their graphs and axis.
7. Look for and make use of structure	Teachers provide opportunities for students to look for, develop, and generalize relationships in mathematics. They provide rich tasks and facilitate pattern seeking and understanding of relationships. Teachers ask students not only to perform math, but to be able to explain why that math works.
8. **Look for and express regularity in repeated reasoning**	The teacher provides problem situations that allow students to explore regularity and repeated reasoning. Students are given rich tasks that encourage them to use repeated reasoning to form generalizations or "shortcuts." It is important that a student can explain why a shortcut works before it is given credence in the classroom.

A full description of each standard for mathematical practice can be found on pages 6-8 of the standards document http://opi.mt.gov/pdf/CCSSO/11NovMathCommonCoreGradeband.pdf.

Curriculum and Essential Standards

> **Curriculum may be the single largest factor that determines how many students in a school will learn.** (Marzano, 2003) as cited in (Schmoker, 2011, p. 25)

It is through the MCCS for Mathematics Practice and Content that "What we Teach" in math is first addressed, as is "the problem of a curriculum that is 'a mile wide and an inch deep.'" (The Montana Office of Public Instruction (OPI), 2011, p. 3). Different strategies can be utilized when considering how to prioritize "What We Teach" to make sure the important things get done before the less important. It is this focus on different topics within each grade level, as well as essential standards within standard clusters, that will drive the development of a coherent and rigorous curriculum.

> **The 80/20 rule guides educators in determining how to use the very limited and precious resources of time, energy, and money to increase positive outcomes for students.** (Confer, C. & Ramirez, M., 2012, p. 59)

The 80/20 rule is a cost benefit analysis that helps educators make decisions regarding what to do and what to give up based on the tradeoffs they will encounter. Rather than trying to do everything not very well, do the important, essential things very well. Doing so will often address the less important issues along the way by necessity.

The Common Core concentrates on a clear set of math skills and concepts. Students will learn concepts in a more organized way, both during the school year and across grades. (Common Core State Standards Initiative, 2012) Designing implementation plans/unit guides for the standards with a loss of fidelity will lead to an incorrect implementation of the standards as they are designed.

For more information about what teachers should be focusing on, essential or "major," supporting, and additional clusters, see http://achievethecore.org/page/774/focus-by-grade-level .

As learning communities go through the process of selecting essential standards to address their school's particular needs, a differentiation between focused standards and fewer standards must be clear. "It is important to recognize that 'fewer standards' are no substitute for focused standards … these standards aim for clarity and specificity" in what content students must *know* and what skills they should be able to *do*.

Planning Mathematics Curriculum

Organizing the standards can be a challenge. Fortunately, there are several curriculum maps that exist on the internet that are helpful. Here are two good resources: https://www.emergentmath.com; http://www.ccsstoolbox.org/.

When planning curriculum, it is important that the grade levels are *vertically aligned*. This means that all teachers know which grade is teaching what so nothing falls through the cracks. Resources to help with alignment are:

- Focus by Grade Level Documents: For teachers that feel like Common Core only added requirements and there isn't enough time to cover every standard. http://achievethecore.org/page/774/focus-by-grade-level.
- Coherence Map: Which standards led up to my grade level and where do my students go from here (great for remediation or enrichment) http://achievethecore.org/coherence-map/.
- Progression Documents: Explain the logic Common Core follows in how the different topics are taught. http://achievethecore.org/coherence-map/ and http://achievethecore.org/page/254/progressions-documents-for-the-common-core-state-standards-for-mathematics-detail-pg.

Principals, teachers, and members of the School Leadership Team should be well versed in reading and understanding the mathematics standards. Further, the MCCS for mathematics includes "researched-based learning progressions" that recognize the diverse learning styles and timing of today's students. (The Montana Office of Public Instruction (OPI), 2011, p. 3)

The integrity of the progressions must remain throughout implementation of the standards or the overall effectiveness of this work is lost. The standards are not designed to be fractured pieces. The flow is from the primary grades to high school builds, and missing pieces along this learning path will lead to misunderstandings/gaps in learning.

> **Fragmenting the standards in individual standards, or individual bits of standards, erases all these relationships and produces a sum of parts that is decidedly less than the whole.** (Daro, P., McCallum, B., and Zimba, J., 2012)**.**

Other researchers refer to the "clusters [that] summarize groups of related standards." (The Montana Office of Public Instruction (OPI), 2011, p. 5) Moving away from "mathematics as a collection of disconnected procedures" into "coherent, interconnected ideas," or "knowledge packages," "highlight connections between and among ideas." (Confer, C. & Ramirez, M., 2012, pp. 94-95)When fully understanding mathematics as a network of ideas, principals and teachers can better develop a "guaranteed and viable curriculum." (Schmoker, 2011, p. 25).

Fidelity and Intentionality

What about the standards and curriculum fidelity, which is often considered to be "rigid adherence to a given sequence of lessons, a 'one-size-fits-all' approach"? Many researchers do not believe there is a "they" who "educators believe is in control and making poor decisions." (Confer, C. & Ramirez, M., 2012, p. 48 and 81).

> **We know that, at the end of the day, each educator has the power to make many choices. … More important than what 'they' do is what *we* will do, and how *we* will do it. … There is no 'they' that stops you from doing the right thing. You, not 'they,' are in control.** (Confer, C. & Ramirez, M., 2012, p. 81)

What then does "fidelity" mean?

> **Does it mean to always follow a math program that someone who doesn't know your students created, or does it mean consistently reflecting on what students do as a result of our decisions and adjusting accordingly** (Confer, C. & Ramirez, M., 2012, p. 132)

Fidelity means the latter: consistently reflect on what students do as a result of our instructional decisions and fluidly in adjusting to student needs. Teaching with intentionality supports the teacher in reflecting on how students are doing. In education, *intentionality* means persisting when the students don't "get it" the first time. Intentionality means not teaching the same thing 'louder and longer,' but "looking for a different way to reach the children." A reflective practitioner not only looks at students' inability to learn but also at their own shortcomings in getting the material across to their students. Intentionality does not blame, but seeks new paths to success through a "culture of can (Confer, C. & Ramirez, M., 2012, p. 130)

The urgency to meet 21st Century learning demands also values the use of text books in coordination with the standards for what is taught. Rather than teaching disconnected snippets of learning, students must be engaged in their learning as never before. A 2005 in-depth study by David Conley of the skills and content needed by students for success in college, which are alternately called "habits of mind," are standards for success in K-12 students in all disciplines.

Conley and his colleagues found that the following four intellectual standards were paramount, within and among the disciplines**:**

1. Read to infer/interpret/draw conclusions.
2. Support arguments with evidence.
3. Resolve conflicting views encountered in source documents.
4. Solve complex problems with no obvious answer. (Schmoker, 2011, p. 28)

Confer and Ramirez echo these thoughts when articulating the "shift in outcome" they want for their students:

Conventional Wisdom	***Shifting for Change***
The "end" that we're aiming for is a child who can perform well on multiple-choice tests.	The "end" is a child who: • thinks and reasons effectively; • solves problems accurately, flexibly, and efficiently; • communicates clearly using mathematical language and representations; and • demonstrates his or her knowledge and skills on performance assessments as well as standardized tests.
Most instruction should focus on memorization of traditional computational procedures and basic facts.	Instruction that balances concepts and skills is important. Both understanding and fluency with basic facts allow students to be effective problem solvers.
Focusing professional development on test scores has the largest payoff for improvement in school mathematics programs.	Focusing on high-quality student work has the largest payoff for improvement in school mathematics programs.

(Confer, C. & Ramirez, M., 2012, p. 18)

High Quality Teachers

To achieve the end results of students who think critically, problem solve, and communicate orally and in writing about mathematics with balances in concepts and skills, it is vital that the implementation of the standards through a guaranteed and viable curriculum is provided by highly qualified teachers. Three imperatives, knowledge of the adopted curriculum, mathematics content, and pedagogy, have been identified as needed to ensure the best presentation of materials by teachers.

As an example, Liping Ma studied the difference between mathematics teachers in China versus in the United States.

> **Ma summarized her findings about teacher knowledge of subtraction with regrouping: Seventy-seven percent of the U.S. Teachers and 14% of the Chinese teachers displayed only procedural knowledge of the topic … the taking and changing of steps. This limitation in their knowledge confined their expectations of student learning as well as their capacity to promote conceptual learning in the classroom** (Confer, C. & Ramirez, M., 2012, p. 94)

Other resources support the need for teachers of mathematics to have deep knowledge of their subject, as well as superlative pedagogical skills, plus, a full understanding of the curriculum they are teaching. Mathematics is more than isolated procedures to be used in a prescriptive manner. Teachers of mathematics must themselves fully understand the mathematics concepts they want their students to learn: teaching fewer concepts but teaching them deeply. The National Council for the Supervisors of Mathematics "identify the critical elements of these imperatives and link them directly to the end goal of raising achievement in mathematics for *every* student and effectively implementing the Common Core State Standards for Mathematics (CCSSM) in *every* classroom." (NCSM, 2014, pp. 20-21)

If mathematics is to make sense to students, it must make sense to the teachers first. As teachers teach and demonstrate mathematics, five strands for teachers are suggested to promote student proficiency:

1. Conceptual Understanding: Comprehension of mathematical concepts, operations, and relations.
2. Procedural Fluency: Skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.
    a. Establish an understanding of the scope of mathematics content knowledge.
    b. Support an understanding of the breadth and depth of mathematics content knowledge.
    c. Create opportunities for teachers to identify deficiencies and develop mathematical content knowledge.
3. Strategic Competence: Ability to formulate, represent, and solve mathematical problems.
    a. What teaching approaches best fit the content and how to best organize the elements of the content for effective teaching.
    b. A blend of what content to teach and how best to teach it.
4. Adaptive Reasoning: Capacity for logical thought, reflection, explanation, and justification to understand how to best sequence, connect, and situate the content they are expected to teach within learning progressions.
5. Productive Disposition: Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.
    a. Understand how and why focus, depth, and coherence make a mathematics curriculum effective.
    b. Develop and deepen understandings of learning progressions
    c. Organize CCSSM content expectations for each grade or course into feasible teaching guides.
    d. Create opportunities for teachers to investigate the curriculum at their grade level and across grade levels.

    (Kilpatrick, J., Swafford, J., & Findell, B. (Eds.), 2001) as cited in (NCSM, 2014, pp. 21-25)

You will find current resources and information through the following links:

TOPIC	LINK
Student Engagement and Critical thinking	https://www.emergentmath.com http://www.illustrativemathematics.org/content-standards
Curriculum Mapping	https://www.emergentmath.com http://www.ccsstoolbox.org/
Rich Tasks By Standards	http://www.illustrativemathematics.org/content-standards
Cluster Emphasis	http://achievethecore.org/page/774/focus-by-grade-level
Vertical Alignment	http://achievethecore.org/coherence-map/
Horizontal Alignment	http://achievethecore.org/page/774/focus-by-grade-level
Progression Documents	http://achievethecore.org/coherence-map/ http://achievethecore.org/page/254/progressions-documents-for-the-common-core-state-standards-for-mathematics-detail-pg

High-performing schools are characterized by the following Standards Subcomponents. (See Appendix A, for complete Self-Assessment.)

Standards **The MCCS Stages of Implementation Continuum** include six stages, which provide comprehensive resources for school districts to self-assess readiness, create action plans, and access targeted resources and processes for aligning curriculum, instruction, and assessment. www.opi.mt.gov/MontanaCommonCoreStandards	
1. Stage 1: The MCCS for each grade and subject area have been thoroughly studied and are understood.	1 2 3 4 5
2. Stage 2: Curriculum has been aligned with the MCCS.	1 2 3 4 5
3. Stage 2: Instructional materials are aligned with the MCCS.	1 2 3 4 5
4. Stage 3: Assessments are aligned with curriculum and with the MCCS.	1 2 3 4 5
5. Stage 4: A comprehensive scope and sequence is communicated and aligned to the MCCS.	1 2 3 4 5
6. Stage 4: A pacing guide outlines a consistent instructional timeline and is adhered to by all staff.	1 2 3 4 5
7. Stage 5: Educators engage in horizontal (e.g., grade level) and vertical (e.g., cross-grade level) alignment of curriculum and assessments.	1 2 3 4 5
8. Stage 6: Educators have analyzed assessment results (e.g., Smarter Balance, curriculum assessments, and independent progress monitoring assessments) and processes are established to make systematic changes based on data results.	1 2 3 4 5
Action Ideas for Standards:	

Standards Summary

The Math Standards

How are the standards different?

- Focus–Each grade level focuses on fewer topics.
- Coherence–The standards link topics and thinking across grade levels.
- Rigor–The new standards pursue conceptual understanding (why the math works), procedural skills and fluency (knowing the steps and math facts), and application (using the math in the real world) with equal intensity.

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- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make sense of structure.
- Look for and express regularity in repeated reasoning.

A full description of each standard for mathematical practice can be found in the standards document: http://opi.mt.gov/pdf/CCSSO/11NovMathCommonCoreGradeband.pdf.

Planning your curriculum. Organizing the standards can be a challenge. Luckily, there are several curriculum maps that exist on the internet. Here are two good resources: https://www.emergentmath.com and http://www.ccsstoolbox.org/

When planning, it is important that the grade levels are vertically aligned. This means that all teachers know which grade is being taught what so nothing falls through the cracks. A few resources to help with alignment:

1. Focus by Grade Level Documents—Great for teachers that feel like Common Core only added requirements and there isn't enough time to cover every standard): http://achievethecore.org/page/774/focus-by-grade-level.
2. Coherence Map—Which standards led up to my grade level and where do my students go from here (great for remediation or enrichment): http://achievethecore.org/coherence-map/.
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INSTRUCTION AND INTERVENTION

#1. Defined

Instruction is the action or process of teaching. Instruction must be focused on appropriate content that aligns with the Montana Common Core Standards (MCCS) for students K-12 and should be presented and organized in a way that reflects current educational research. Instruction should also consider the development of students' mathematics identity by supporting the 5 strands of mathematical proficiency. (NCSM, 2014)

Intervention is additional instruction provided to students to meet their specific needs while at the same time accelerating their growth toward grade-level benchmarks. An intervention could be an educational practice, strategy, curriculum, or program used to support students' needs beyond the basic grade level instruction.

Differentiated Instruction

Differentiated instruction should be provided to accelerate learning and maximize student achievement for all students as part of Tier 1 instruction. The classroom teacher should provide flexible instructional grouping of students based on their ongoing identified needs. Classroom teachers should be clear about *what* they are trying to teach and *why* it is important. Research has shown that teachers are often too random in their delivery of instruction, unclear as to what they are teaching, and unable to define the succinct reason for instruction.

When differentiating, teachers should:

- Have clear objectives for instruction.
- Deliver targeted instruction aligned with standards.
- Provide focused activities.
- Adjust the instructional complexity through differentiation.

In Tier 2 and Tier 3, differentiation is provided through addressing specific targeted needs through targeted intervention. This instruction occurs in smaller groups with increased intensity. Often, another educator delivers Tier 2 and Tier 3 instruction, but coordinates with the classroom teacher. Progress monitoring occurs more frequently and provides the information needed to make instructional decisions. (Beebe-Frankenberger, M., Ferriter-Smith, T., & Hunsaker, D., 2009, p. 18)

Mathematics Instruction for Special Education Students

Every student deserves to be placed in the most inclusive learning situation and every student deserves to receive instruction at his or her highest possible capacity. However, some students, including those with identified disabilities, will demonstrate persistent learning difficulties even though they benefit from a supportive home environment and receive excellent instruction at school. Such students will benefit from Tier 2 or 3 small-group, skills-based instruction that is aligned and coordinated with the classroom instruction and based on the MCCS.

Special education students do not necessarily need instruction that is substantially different from that which everyone else is receiving. Rather, they may need the instruction to be fine-tuned to fit their individual learning needs. What constitutes good special education lies in the intensity and focus of instruction. (Moats, L.C., & Hall, S., 2002)

Response to Intervention is a tiered approach to meeting the needs of children beginning in preschool. A tiered approach allows for increased intensity of supports and services as the child's needs increase. (Coleman, M.R., Buysse, V., & Neitzel, J., 2006)

#2 Two Main Goals of Effective Instruction and Intervention

1. **Alignment of Instructional Materials and Content**

All students should receive high-quality core classroom instruction (Tier 1) that utilizes programs and materials that are based on current educational research and that is designed and differentiated to meet their needs. Further, the selection of essential standards to teach provide "simplicity, clarity, and priority" to instruction. (Schmoker, 2011, p. 12)

The *Principles and Indicators for Mathematics Education (PRIME) Leadership Framework* (NCSM, 2008) asserts that "high quality programs provide access to effective teaching of important mathematics and foster high levels of achievement for every student. High quality programs are grounded in school-level conditions that enhance adult professional development and learning, support research-informed practice, and are guided by leadership that support the ongoing improvement of curriculum, instruction, and assessment."

2. **Mathematics Proficiency**

Proficiency in mathematics includes ". . . the ability to participate and perform effectively in mathematical contexts." Several strands of student learning that need to be developed include:

Strand	Meaning
1. Conceptual understanding	Comprehension of mathematical concepts, operations, and relations
2. Procedural fluency	Skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
3. Strategic competence	The ability to formulate, represent, and solve mathematical problems
4. Adaptive reasoning	The capacity for logical thought, reflection, explanation, and justification
5. Productive disposition	A habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy

(Aguirre, J; Mayfield-Ingram, K; & Martin, D.B., 2013, p. 17)

#3 Elements of Effective Instruction

Elements of effective instruction follow patterns that have proved to be successful in supporting student achievement. Rosenshine described this form of instruction as "a systematic method for teaching with emphasis on proceeding in small steps, checking for student understanding, and achieving active and successful participation by all students." (Rosenshine, 1987, p. 34) as cited in (Archer & Hughes, 2011, p. 1) Sixteen elements of explicit instruction are summarized in table below:

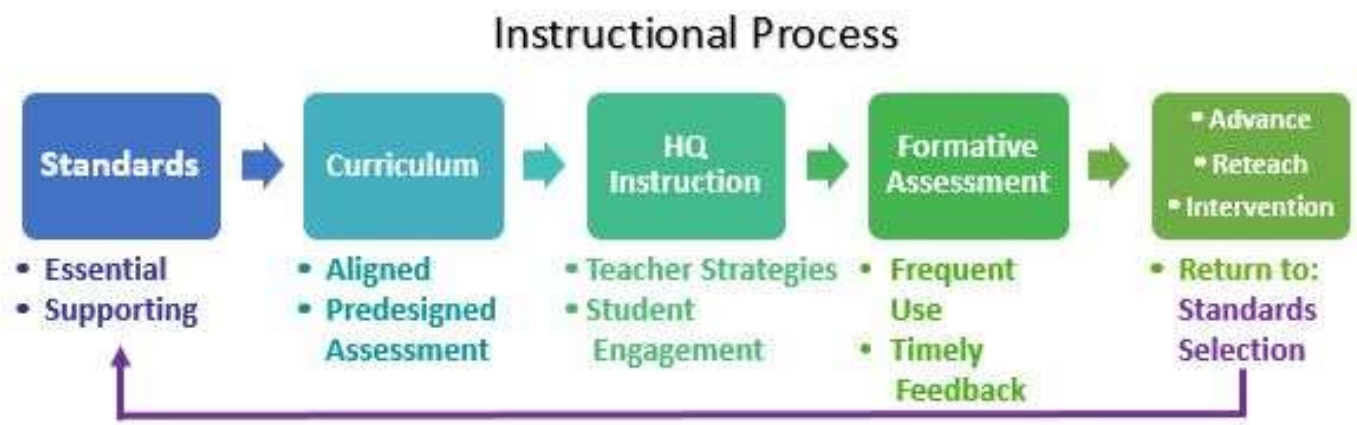
Elements of Effective Instruction

Focus instruction on critical content	Provide an adequate range of examples and non-examples
Sequence skills logically	Provide guided supported practice
Break down complex skills and strategies into smaller instructional units	Require frequent responses
Design organized and focused lessons	Monitor student performance closely
Begin lessons with a clear statement of the lesson's goals and your expectations	Provide immediate affirmative and corrective feedback
Review prior skills and knowledge before beginning instruction	Deliver the lesson at a brisk pace
Provide step-by-step demonstrations	Help students organize knowledge
Use clear and concise language	Provide distributed and cumulative practice

(Archer & Hughes, 2011, pp. 2-3)

Numerous other researchers support these 16 elements. The following summarizes and gives support to elements of effective teaching.

The Instructional Process



Element:	Looks like:	Look For:	Need more information?
1) Selection of essential and supporting **standards** which clearly determine learning goals	• Essential standards taught deeply using supportive standards • Lesson objectives are clearly posted in student-friendly wording; referred to during instruction	• Standards Clusters	(Schmoker, 2011, pp. 10, 57)
2) Development of aligned **assessments** based on learning goals and expectations of student proficiency Backwards design of **curriculum units and lessons** from predesigned assessments • Including strategies for differentiation, intervention, and special education students	Predesigned assessments based on clearly identified learning expectations and goals to maintain focus Lessons are "backwards designed" to maintain focus of instruction on learning goals, anticipating the need for: • Differentiation • Possible interventions needed • Attending to the needs of special education students	• Curriculum is aligned with the standards • Predesigned assessments focused on learning goals • Clear objective • Teacher anticipation of student needs • Patterns of speech • Knowledge packages • Learning pathways	• (Confer, C. & Ramirez, M., 2012) • (NCSM, 2014, p. 31) • (The Montana Office of Public Instruction (OPI), 2011) • (NCSM, 2014, p. 35)

<u>High Quality Teacher:</u> disciplinary knowledge and pedagogical expertise Implementation of instruction with fidelity • Utilizing explicit and systemic instruction strategies	Teachers must be: • Skilled practitioners • Crystal clear about mathematical concepts • Understand the processes students take for understanding • Focused on learning goals • Use strategies to engage students • State objective and relevance • Review critical prerequisite skills Expert practitioners understand that: • Teaching with "fidelity" means meeting students' learning needs and not rigid adherence to a program or schedule • Common elements of explicit instruction provide successful learner outcomes • Gradually releasing accountability for learning to students support student autonomy and success	**<u>Teacher Strategies:</u>** • Clear objectives • Chunking instruction • Less abstraction • Gradual release • Productive struggle **<u>Student engagement:</u>** • Multiple solutions accepted • Opportunities for academic discussion and reading • Frequent writing to explain	• (Confer, C. & Ramirez, M., 2012) • (Archer & Hughes, 2011, p. 42) • (Confer, C. & Ramirez, M., 2012, pp. 130-32) • (Schmoker, 2011, p. 57) • (Archer & Hughes, 2011, p. 40)
3) **<u>Formative assessments</u>** with timely feedback	• Frequent use with immediate feedback to students has definite, positive impact on student achievement • Helps to clearly identify what students are expected to know and be able to do	• Frequent use to monitor student understanding • Feedback is immediate and positive or corrective • Predesigned to align instruction	• (NCSM, 2008) • (Archer & Hughes, 2011) • (Mazur, 1997) as cited in (Schmoker, 2011, p. 70)

Element:	Looks like:	Look For:	Need more information?
4) Use data to **monitor instruction** and **intervention**	Use of both formative and summative data leads to revisions of instruction at all levels: student, lesson, unit, and program The ultimate goal is to assist and accelerate learning so that students exit intervention	Data from a range of assessments indicate: • Proficiency • Reteaching • Need for intervention • Data driven • Fluid movement into and out of intervention as students achieve success	(NCSM, 2014, p. 37) (Beebe-Frankenberger, M., Ferriter-Smith, T., & Hunsaker, D., 2009)

Supporting Struggling Students

What Works Clearinghouse Institute of Education Sciences developed a practice guide outlining the best practices for assisting students who are struggling in mathematics. The guide outlines recommendations to help Tier 2 and 3 students be successful within interventions. The guide offers the following recommendations:

1. Instructional materials for students receiving interventions should focus intensely on in-depth treatment of whole numbers in kindergarten through grade five and on rational numbers in grades four through eight. These materials should be selected by committee.
2. Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.
3. Interventions should include instructions on solving word problems that are based on common underlying structures.
4. Intervention materials should include opportunities for students to work with visual representations of mathematical ideas, and interventionists should be proficient in the use of visual representations of mathematical ideas.
5. Interventions at all grade levels should devote about 10 minutes each session to building fluent retrieval of basic arithmetic facts.
6. Include motivational strategies in Tier 2 and Tier 3 interventions.

(Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B., 2009)

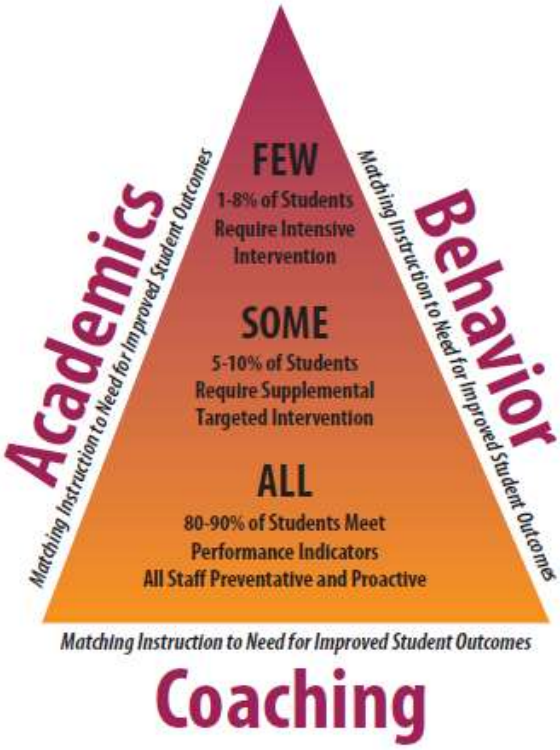
#4 Tiered Instruction

Effective core classroom instruction should meet the needs of *most* students, but a multitiered system for providing high-quality intensive intervention is required to meet the needs of *all* students.

Response to Intervention (RTI) in Montana is a multitiered system of support. (Beebe-Frankenberger, M., Ferriter-Smith, T., & Hunsaker, D., 2009) This system of support provides guidance for delivering

comprehensive, quality instruction for all students. RTI is a general education process that provides students with high-quality research-based instruction (Tier 1), and interventions (Tiers 2 and 3) that are matched to the student's specific needs. Data are used to drive decisions about individual student progress and to determine the appropriate instructional plan necessary for a student to achieve grade-level success. Intervention instruction focuses on one or more key areas of literacy development, is clearly defined, implemented with fidelity, and is delivered daily to maximize instruction and intervention benefits. The goal of intervention is to respond quickly to the needs of students who may be at risk of not meeting standards and to get them back on track. Montana's RTI framework is designed to provide evidence-based instruction and targeted interventions that lead to student success.

Below is a graphic representation of the Montana RTI Framework.



Tier 1 Core Classroom Instruction
All students should receive core classroom instruction utilizing evidence-based curriculum and methods to teach critical elements of subjects, such as reading, math, and written expression. Approximately 80 to 90 percent of students will have a sufficient response to instruction by demonstrating subject proficiency with effective Tier 1 instruction. Students who score at the higher level of Tier 1 should receive instruction that will continue to keep them challenged.

Tier 2 Strategic Targeted Instruction
Some students will receive strategically-targeted instruction in addition to core instruction. Strategic Instruction addresses the specific needs of students who do not make sufficient subject progress in Tier 1. Tier 2 interventions are targeted to teach specific skill needs, are evidence based, and align with core classroom instruction. Approximately 5 to 10 percent of students will require Tier 2 instruction. The duration of this instruction varies based on student assessment results and progress monitoring data that measures student response to intervention.

Tier 3 Intensive Targeted Intervention
Intensive-targeted instruction is provided to the *most at-risk students* who have not responded sufficiently to Tier 1 and Tier 2 instruction. This small percentage (1 to 8 percent of students) usually have severe skill difficulties and require instruction that is more explicit, more intensive, and specifically designed to meet individual needs. Intensive instruction should take place in addition to Tier 1 instruction; however, it may, in a few instances, replace core instruction. Students needing targeted Tier 3 interventions will have additional instruction daily (e.g., 90 minutes of Tier 1 instruction

plus 60-90 minutes of intervention instruction). Tier 3 interventions may replace Tier 2 instruction and should be provided by the most qualified teacher within a smaller group of students. The duration of this intervention is extended over a longer period of time and varies based on student assessment and progress monitoring data.

Student Movement through the Tiers

Student movement through the tiers is a fluid process based on student assessment data and collaborative team decisions about students' response to instruction. A goal of the process is to accelerate learning so that students exit intervention. At any time during this process, a student may be referred for consideration for a 504 Plan and/or special education evaluation.

RTI for Mathematics

International comparisons of mathematics achievement indicate:

- Key deficiencies include "whole number arithmetic, fractions, ratios, and proportions."
- All students "should receive preparation from an early age."
- An emphasis is on "the need for mathematics interventions that mitigate and prevent mathematics difficulties."

RTI best effective practices include:

- High quality instruction and universal screening.
- Intensive interventions.
- Measured student response to intervention indicating:
  - No further intervention needed.
  - Continue some intervention.
  - Need for more intensive intervention.
- The levels are reported in tiers.

(Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B., 2009)

The report "Assisting Students Struggling with Mathematics: Response to Intervention (RTI) for Elementary and Middle Schools" (Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B., 2009)offers research and practical application information for response to intervention for grades K-8. More information can be found at http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=2.

More detailed information from smaller studies for middle and high school RTI can be found at http://www.rti4success.org/resource/tiered-interventions-high-schools-using-preliminary-lessons-learned-guide-ongoing (The National Center on Response to Intervention & Center on Instruction, 2010) and http://interventioncentral.org. (Wright, n.d.)

RTI Recommendations for Tier 1: Within the RTI process, all students receive Tier I instruction and support. All students receive academic screening to identify those at risk. Progress monitoring will continue to identify students scoring slightly above or slightly below the screening cut off score for placement in tier groupings.

RTI Recommendations for Tier 2 and Tier 3: The following are eight recommendations made for Tier 2 and Tier 3 students.

Recommendation	Concepts
Screening	Identifies those at risk in order to provide intervention at the proper level.
Instructional materials	This includes concept and skills introduced earlier but not fully understood. • In depth treatment of whole numbers. • In depth treatment of rational numbers.
Explicit, systematic instruction	Intervention should be systematic and explicit. Research indicates the following: • Clear models for solving problems provided, using an array of examples. • Students have opportunities for extensive practice on newly learned skills. • Students have think-aloud and discussion time about their decisions. • Extensive feedback to students is provided. (National Mathematics Advisory Panel, 2009)
Solving word problems	Intervention should include instruction on solving word problems based on common underlying structures, given operations, and their inverse (e.g. addition/subtraction).
Visual representation/less abstraction	Interventions should include opportunities for student's work with visual representations of mathematical concepts. Interventionists should be proficient in using mathematical concepts, including translating abstract symbols into meaningful visual representations.
Basic arithmetic facts	Interventions at all grade levels should devote about 10 minutes each session to building fluent retrieval of basic arithmetic facts.
Monitoring of progress	Monitor progress of students receiving supplemental instruction, as well as other students who are at risk, specifically with formative assessments. Two types of ongoing monitoring are recommended: 1. Curriculum embedded assessments for that day or week's learning to determine: a) need for more time; and b) placement in tier groupings. 2. Regular monitoring of students scoring slightly above or below the screening cut off score to provide the school with a sense of how the overall math program is affecting a given student.
Motivational strategies	Motivational strategies are to be included in Tiers 2 and 3, which include tools that can encourage active engagement of students and acknowledge their accomplishments. **Note:** One "key difference" for high school implementation is student participation in the design, development, and decision-making process noted for "…leading to better intervention design and greater commitment to intervention implementation" (Reschly, D. J., & Wood-Garnett, S., 2009) as cited in (The National Center on Response to Intervention & Center on Instruction, 2010, p. 6)

#5 Technology to Support Student Learning

Research indicates that technologies use in the classroom can have an additional positive influence on student learning when the learning goals are clearly articulated prior to the technologies use. (Ringstaff, K., & Kelley, L., 2002) Applied effectively, technology implementation not only increases student learning, understanding, and achievement but also augments motivation to learn, encourages collaborative learning, and supports the development of critical thinking and problem-solving skills. (Schacter, J., & Fagnano, C., 1999)

Individuals bring a variety of skills, needs, and interests to learning. The Universal Design for Learning (UDL) is a set of principles for curriculum development that gives all individuals equal opportunites to learn. By considering the what, how, and why of learning, teachers present information and content in different ways, differentiate the ways that students can express what they know, and stimulate interest and motivation for learning. Through the use of technology tools and the principles of UDL, teachers are able to plan for learning opportunities that meet the needs of all students.

In order to put research into practice, schools are encouraged to implement technology through the following processes:

- Website resources.
- Universal design technology resources, such as CAST UDL Curriculum resources, UDL Book Builder, UDL Editions, and CAST Strategy Tutor for all Tiers, but especially Tier 2 and 3 for meeting the needs of disadvantaged students.
- Teacher resources, such as document cameras for building background knowledge and mobile device labs for making learning relevant for students through real life connections to content.

The research on the effectiveness of educational technology for enhancing mathematics achievement in the classroom shows the most effective type of computer-based learning to be computer-assisted instruction. This is based on the meta-analysis of research from A. Cheung and R. E. Slavin. “Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination of text, graphics, sound, and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum. CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.” (WikiEducator, 2008) Some examples of computer-assisted instruction programs are Odyssey Math, Success Maker, Plato, Academy of Math, Dreambox Learning, Aha! Math, and I CAN Learn.

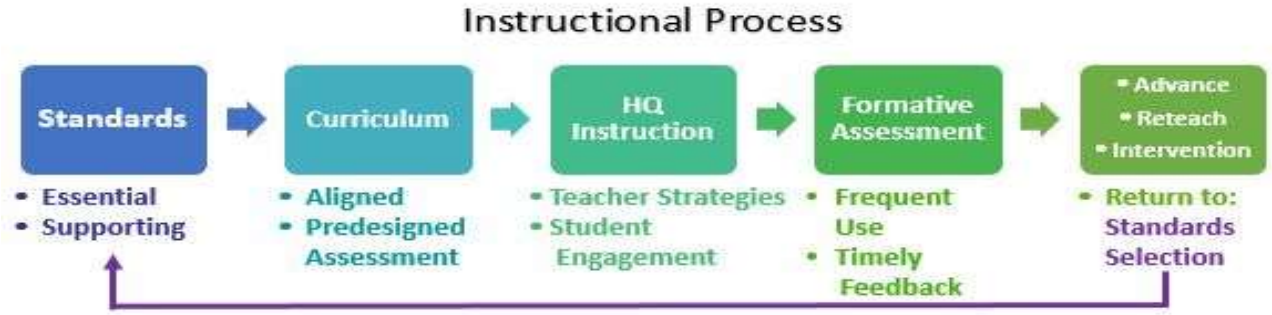
#6 Electronic Self-Assessment for Mathematics

High-performing schools are characterized by the following Instruction and Intervention Subcomponents, with specific additions for mathematics instruction. (OPI, 2012)

High-performing schools are characterized by the following Instruction and Intervention Subcomponents. (See Appendix A for complete self-assessment.)

Instruction and Interventions	
1. Instructional materials and content are aligned to the MCCS.	1 2 3 4 5
2. Instructional materials and content include explicit and systematic instruction in numeracy, thoughtful planning around clusters, essential and supporting standards and disciplinary reading, writing, listening, and speaking in mathematics.	1 2 3 4 5
3. Instructional leaders ensure time and access for mathematics instruction during the school day is a priority and adequate time and scheduling for mathematics interventions.	1 2 3 4 5
4. Tiered instruction is clearly defined and implemented with fidelity.	1 2 3 4 5
5. Additional support is provided for learners with Tier 2 and Tier 3 needs through intensified interventions (e.g., smaller group sizes, increased time, or varied instructional materials).	1 2 3 4 5
6. Instructional leaders ensure that instructional materials are readily available for all instruction and intervention settings.	1 2 3 4 5
7. Technology is utilized to support student learning (e.g., software or digital devices that students use to learn, access, organize, and communicate information).	1 2 3 4 5
Action Ideas for Instruction and Intervention:	

Instruction and Intervention Summary



1. **<u>The Instructional Process</u>**–The mathematics plan breaks down the instructional process. Below are some tools to help organize your curriculum:
    - Curriculum mapping: http://www.ccsstoolbox.org/

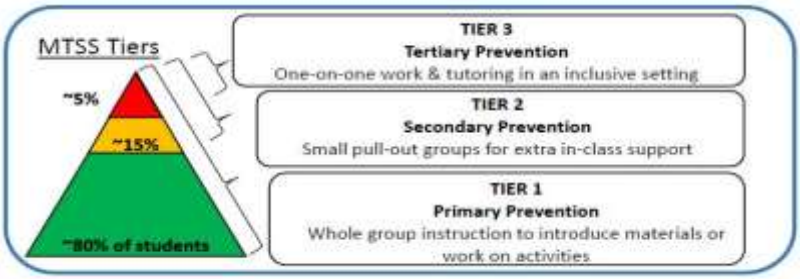
- Prioritizing time and standards: http://achievethecore.org/page/774/focus-by-grade-level
- How the standards relate to one another: http://achievethecore.org/coherence-map/

2. **Hands-on Engaging Instruction**–Students need to interact with and develop conceptual understanding of the math. Breaking problems into step-by-step processes for student memorization might give the appearance of student learning but lacks true understanding and retention. Use rich tasks to increase critical thinking, student engagement, and retention:
   - https://www.emergentmath.com
   - http://www.illustrativemathematics.org/content-standards
   - 3 Act Math—http://wmh3acts.weebly.com/3-act-math.html
   - **Student Discourse and Explanation**–When a teacher is doing all of the talking, they are doing all of the work. When a teacher is doing all of the work, they are doing the learning; not the students. Here are some quick steps to increase student discourse and engagement:Never say anything a kid can say!
   - Ask good questions.
   - Use more process questions rather than product questions.
   - Replace lectures with sets of questions.
   - Be patient.
   - Use Think-Pair-Share.
   - Engage in academic reading.
   - Provide opportunities for writing to explain.

   For more information, read the article "Never Say Anything a Kid Can Say" by Steven C. Reinhart. This can easily be found using Google.

3. **Differentiation**–Differentiation doesn't mean writing a separate lesson plan for each student; differentiation means helping each student succeed with the lesson you will be using for the entire class. A great way to do this is to use 'tiered lessons' that are accessible to all students but get progressively more challenging. Tiered lessons keep the faster students busy while the teacher can give support to students struggling on the first tiers. Many 3 Act Math lessons (linked above) have extension activities for this reason. A teacher could also add tiers to existing lessons.

4. **MTSS Tiers**–The mathematics plan explains the Multi-Tiered Systems of Support in language that can be described as follows:



Assessment and Data-Based Decision Making

Defined: Assessment is the process of collecting data for the purpose of improving learning. Assessment may be formal or informal and may be conducted through an assortment of methods. A comprehensive assessment framework includes regularly scheduled sessions for reviewing data to make informed decisions about instruction.

Alignment to Standards

Assessment tools and procedures need to be aligned to the Montana Common Core Standards (MCCS) across all content areas. The MCCS provide a consistent, clear understanding of what students are expected to learn. Assessments help teachers identify students who are meeting age or grade-level mathematics standards and those who are "at risk" for difficulties so that appropriate instruction and intervention are provided.

Comprehensive Assessment System

A comprehensive assessment system provides a structure that defines which assessments should be administered, when they should be administered, to whom they should be administered, and how the assessment results will be used. Multiple evaluation and assessment strategies are used to monitor and modify instruction in order to meet student needs. The results of assessments are used to improve instruction and to increase student achievement. Assessment is often categorized as either formative or summative based on the intended use of the information collected.

Formative Assessments guide current and ongoing instruction. The results of formative assessments, such as screening, progress monitoring, and diagnostic measures, are used to adjust instruction to meet individual and group needs on a continuous basis.

Summative Assessments are used to measure students' overall learning or outcome of the curriculum and standards. Summative assessments are given at the end of units, mid-term, and at the end of a course and are designed to judge the extent of students' learning of the material in a course for the purpose of grading, certification, evaluation of progress, or for researching the effectiveness of a curriculum. (Bloom, Hastings, & Madaus, 1971, p. 117)

Screening involves all children and is usually done at set benchmark points, such as the beginning and middle of the school year or the end of a unit of study. Screenings determine level of mastery of grade-level standards.

Progress Monitoring involves frequent measurement to determine whether students are making adequate progress toward mastery of grade-level standards. These assessments should be administered as part of a regular instructional routine: weekly, biweekly, or monthly, depending on

student need. The more intense the intervention, the more frequently progress monitoring should occur.

Diagnostic Assessments help teachers plan instruction by providing in-depth information about students' skills and instructional needs. Diagnostic assessments are individually administered to students at risk for failure and provide specific information needed to guide appropriate instruction.

A comprehensive assessment system should provide information on the effectiveness of instructional programs, should identify support and resources that are needed for improvement, and should provide information for individual as well as group needs. Informal assessments provide data from classroom activities, observations, conferencing, student projects, and work samples. Formal assessments provide data using standardized tests or procedures under controlled conditions. A comprehensive assessment system is a balance of formative, summative, formal, and informal assessment procedures that indicate teacher effectiveness and student level of mastery of critical instructional standards.

Using Student Data to Inform Instruction

To maximize the benefits of student achievement, teachers engage in an ongoing problem-solving cycle in which multiple data sources inform instructional decisions. Both teachers and students benefit when routine and systemic data is collected and interpreted collaboratively in grade-level or department-specific teams. Through collaboration, teachers share effective practices, develop common expectations, and work toward meeting the most pressing instructional needs.

Step 1: **Define the problem or goal** by determining the difference between what is expected and what is occurring. Ask, "What specifically do we want students to know and be able to do when compared to what they do know and are able to do?" When engaged in problem solving at the individual student level, the team should strive for accuracy by asking, "What exactly is the problem?"

Step 2: **Analyze the problem** using data to determine why the issue is occurring. Generate hypotheses (reasons why students are not meeting performance goals) founded in evidence-based content area knowledge, alterable variables, and instructionally relevant domains. Gather assessment data to determine valid/non-valid hypotheses. Link validated hypotheses to instruction/intervention so that hypotheses will lead to evidence-based instructional decisions. Ask, "Why is/are the desired goal(s) not occurring? What are the barriers to the student(s) doing and knowing what is expected?" Design or select instruction to directly address those barriers.

Step 3: **Develop and implement a plan** driven by the results of the team's problem analysis by establishing a performance goal for the group of students or the individual student and developing an intervention plan to achieve the goal. Then delineate how the student's or group of students' progress will be monitored and implementation integrity will be supported. Ask, "What are we going to do?"

Step 4: **Measure response to instruction/interventions** by using data gathered from progress monitoring at agreed upon intervals to evaluate the effectiveness of the intervention plan based on the student's or group of students' response to the intervention. Progress-monitoring data should directly reflect the targeted skill(s). Ask, "Is it working? If not, how will the instruction/intervention plan be adjusted to better support the student's or group of students' progress?" Team discussion centers on how to maintain or better enable learning for the student(s). (Florida Center for Interactive Media, 2015)(http://www.florida-rti.org/floridaMTSS/psp.htm)

The Continuous Improvement Cycle (Appendix C) outlines scheduling recommendations for the continual review of data through an inquiry-based problem solving model. The leadership section of this document outlines these four instructional decision making steps.

Grouping and the Effective Use of Data

Effective use of data for informing instruction needs to be done in a timely and efficient manner. Disaggregation, or separation of students into groups, is important for identifying specific needs. Student movement from group to group should be based on which skills have been mastered and which skills still require additional instruction and practice. Resources and support for teachers should be provided for data analysis and interpretation. Universal screening should be used to group students based on similar needs, diagnostic assessments allow teachers to dig deeper to be more informed about grouping needs, and progress monitoring probes are used to continually assess student progress toward mastery of critical mathematics skills defined by the standards. Stiggins suggested, "Changing schools from places that merely sort pupils based on achievement into places that assure that all pupils meet the standards bring with it the challenge of rethinking the dynamics of assessment." (Stiggins, 2007) as cited in (OPI, 2012, p. 38) Ultimately teachers should be able to use formal and informal assessments within their day-to-day interactions with students to immediately inform their next steps for instruction.

Assessing the Effectiveness of Instructional Programs

A comprehensive assessment system requires a *school-level* management plan that assesses the effectiveness and quality of instructional programs to guide improvement. The plan should include a description of the program being evaluated, evaluation questions or objectives, data sources, data gathering methods, and data analysis methods. Program strengths and weaknesses and recommendations for the future should result from the assessments.

The Continuous Improvement Cycle (Appendix C) outlines the processes for continually improving mathematics programs within a school or district.

Regularly Scheduled Data Analysis Discussions

An ongoing Continuous Improvement Cycle provides a structure for regularly scheduled data analysis discussions that inform ongoing learning. These discussions may take place among school leadership

teams, grade-level teams, department or content teams, or mixed data teams. Through these discussions, team members make informed decisions about allocating more time for instruction of essential skills, which skills to target, implementing different teaching techniques and strategies, and adjusting student placement within instructional groups.

The Continuous Improvement Cycle (Appendix C) outlines scheduling recommendations for the continual review of data to use for this purpose. The leadership section of this document also outlines the role that collaborative teams play in ongoing discussions for continuous mathematics improvement.

Data Collection System

In order to use assessment data effectively, a comprehensive assessment system requires a school-level data collection system. A number of Web-based data management resources allow schools to enter data locally and produce data summaries and individual student charting that are helpful in interpreting results. Data management resources allow for easy disaggregation of data into specific groups of students (e.g., gender, free and reduced lunch, ethnicity, instructional recommendations). These services significantly ease the ability to manipulate student data for timely use for guiding efficient classroom and school-level decision-making, so investing in an efficient data management tool is critical to the long-term success of a comprehensive assessment plan.

Valid and Reliable Assessment Administration

Data generated by assessments are only as reliable as the extent to which the assessments are implemented in a consistent and standardized way. Student test results depend upon assessments being implemented and scored correctly and in the same manner. A test's reliability is the degree to which it provides a dependable, consistent measurement of a specific trait or ability. The reliability of a test refers to stability of measurement over time. A reliable measure is likely to produce similar results regardless of who the test administrator is. The validity of a test is the extent to which it measures what it is meant to measure. In discussing a test's validity, it is important to keep its purpose in mind. In order for schools to produce valid and reliable test results, test administrators should be trained extensively on standard test administration. Training for an assessment instrument should include practice being competent in administering the assessment. Periodic "booster sessions" where assessors are retrained on assessments are an important way to prevent "drift" in the way assessments are administered and scored. Most assessments include administration checklists that can be used for integrity checks to verify the fidelity or integrity of assessment implementation.

High-performing schools are characterized by the following Assessment and Data-Based Decision Making Continuous Improvement Subcomponents. (See Appendix A, for complete Self-Assessment.)

Assessment and Data-Based Decision Making	
1. Assessment tools and procedures align to the MCCS.	1 2 3 4 5
2. Comprehensive assessment system includes both formative and summative assessments.	1 2 3 4 5
3. Collaborative teams use a specific protocol for examining student data and making instructional and intervention decisions (e.g., universal screening, progress monitoring, diagnostic, and outcome measures are defined by when, who, and where).	1 2 3 4 5
4. Data is disaggregated by subgroups and provided to educators for instructional decision making in a timely and efficient manner.	1 2 3 4 5
5. A comprehensive plan assesses the effectiveness of the instructional program and guides adjustments for improvement.	1 2 3 4 5
6. Regularly scheduled data analysis discussions occur to assess and adjust ongoing learning (e.g., bi-weekly grade level meetings or data meetings).	1 2 3 4 5
7. A data collection system is in place and technology support is available for continuous access of the data system.	1 2 3 4 5
8. Assessors receive professional development on valid and reliable assessment administration and fidelity of assessment administration is verified (e.g., checklists, observations).	1 2 3 4 5
Action Ideas for Data-based Decision Making:	

Assessment and Data-Based Decision Making Summary

The **purpose** of data is to inform teachers of what the students are and are not learning. There are many different types of data collection that make up a comprehensive assessment framework with each type serving a different role.

Formative Assessments guide current and ongoing instruction and allow teachers to adjust instruction to meet individual and group needs on a continuous basis.

Summative Assessments are used to measure students' overall learning or outcome of the curriculum and standards.

Screening involves all children and is usually done at set benchmark points to determine level of mastery of grade-level standards.

Progress Monitoring involves regular and frequent assessments to measure whether students are making adequate progress toward mastery of grade-level standards.

Diagnostic Assessments are individually administered and help teachers plan instruction by providing in-depth information about students' skills and instructional needs.

Analyzing Data is a process of looking at the information collected and using a process of analysis to determine next steps. The steps include:

Step 1: **Define the problem or goal** by determining the difference between what is expected and what is occurring.

Step 2: **Analyze the problem** using data to determine why the issue is occurring.

Step 3: **Develop and implement a plan** driven by the results of the team's problem analysis by establishing a performance goal for the group of students or an individual student and developing an intervention plan to achieve the goal.

Step 4: **Measure response to instruction/interventions** by using data gathered from progress monitoring at agreed upon intervals.

Successful grouping of students based on the data is critical to meet their instructional needs and should occur in a timely and efficient manner. Students can be grouped in several ways:

- Group students with similar ability levels.
- Groups are set up to contain a variety of skill levels.
- Pair a high partner with a low partner. However, it is not recommended to partner a top student with the lowest student; keep the pairs closer to the same skill level.

Effective use of data: Teachers need data from benchmark tests and other assessments as soon as possible so they can use it to drive instruction. The data must be usable to inform instruction and planning.

PROFESSIONAL DEVELOPMENT

A Note on the Math Standards and Professional Development

The Montana Common Core Standards (MCCS) for mathematics has set a higher bar for student learning expectations and changed some of the math learning progressions. For this reason, teachers may have to address math topics they haven't worked with before. Teachers should look at the new standards and determine if math content professional development would benefit their practice.

High Quality Professional Development

In June 2015, a group of Montana teachers, administrators, and higher-education faculty came together to determine what made professional development effective. The group used the Learning Forward Standards for Professional Development, research studies, and other resources to determine that all effective professional development had three factors in common. The factors were:

Content

High-quality professional development focuses on content that:

- emphasize the subject matter of the professional development;
- specify the changes in teaching practice that are modeled and/or demonstrated;
- specify goals for student learning; and
- emphasize the ways students learn subject-matter content.

Active Learning

High-quality professional development focuses on active learning should allow:

- observation of best instructional practices;
- practice of best instructional practices;
- planning time for classroom implementation; and
- review of student work.

Coherence

Coherent high-quality professional development should:

- build on what teachers have already learned;
- emphasize content and instruction aligned with Montana content standards, and local curriculum and assessments; and
- support teachers in developing sustained, ongoing professional communication with other teachers.

Job-Embedded Professional Development

Organizational structures that support ongoing professional development provide and protect adequate time for teachers to meet and collaborate as part of the regular workday. Research shows that the benefits of participating in collaborative professional development include building shared knowledge, intellectual purpose, and collective responsibility for student learning. (Calkins, A; Guenther, W; Belfiore, G;, 2007) In addition, teachers who collaborate with peers have more opportunities to learn from one another and a greater desire to continuously develop effective practices. Ongoing, job-embedded professional development can be provided in various ways. Some examples include professional learning communities (PLCs), coaching, and peer mentoring.

Professional Learning Communities*:* Hoard and Sommers (2008) define PLCs as "communities of professionals working to improve student learning together, by engaging in continuous collective learning of their own." (Hord, S. M. & Sommers, W. A., 2008, p. ix) Effective PLCs are implemented in various ways; however, "clear shared values and norms, collectively reinforced, increase the likelihood of teachers' success." (Louis, K. S., Kruse, S. D., & Marks, H. M., 1996, p. 181) Collective learning and ongoing analysis of student work and results provide teachers the opportunity to openly discuss problems and concerns and share ideas about how to address those problems and concerns.

Coaching*:* Joyce and Showers (2002) have proven that transfer of practice rarely occurs without the use of coaching within the classroom environment. Effective coaching offers teachers opportunities to practice new strategies more often and with greater skill. Teachers who have had experience with classroom coaching are able to adapt new strategies more appropriately to their own goals and contexts, retain and increase skills over time, and are more likely to explain the teaching strategies to their students, ensuring that students understand what is expected of them. Coaching provides educators opportunities to learn from and with one another within the classroom and can increase the instructional capacity of schools and teachers and, in turn, increase student learning.

Peer Mentoring/Partnering*:* Since teachers naturally turn to each other for help more often than to an administrator, teachers helping teachers has become a formalized and well-received way of ensuring direct assistance to every staff member. Preparations for teachers would include training on understanding the purpose and procedures of peer mentoring/partnering, conducting conferencing and observation protocols, and action protocols. Some districts use collaborative approaches that are not as direct; however, if there is a lack of direction in peer-mentoring programs, well-intentioned teachers will have a vague sense of having done something pleasant but little sense of accomplishment. Peer mentoring/partnering most often results in trusting relationships that provides beginning teachers a successful entrance to the profession and gives experienced teachers a way to stay sharp. Student work and results are discussed and shared as teachers work together to plan instruction, share ideas, and engage in joint problem solving. Effective peer mentoring/partnering is

achieved when an administrator helps select and prepare mentors/partners, assists with matching of mentors/partners, and provides ongoing support.

Themed Professional Development

It is unrealistic to expect a teacher to change more than 10 percent of their practice in a given year. That being said, it is unprofessional for that same teacher to not change their practice by 10 percent in that year. (Leinwand, 2015) It is important for a school to choose a theme to focus on for the year's professional development. A professional development plan that lacks focus and coherence can distract and frustrate teachers. A professional development theme is more effective when it is an integral part of the school's larger standards-based reform effort and linked to content, curriculum, and assessment practices. (Darling-Hammond, L., Chung Wei, R., Andree, A., Richardson, N., and Orphanos, S., 2009) Administrators and teachers should collaborate to use student and school data when planning and implementing professional development. The leadership team uses student assessment results to identify student needs and to guide both the instructional plan for students and the professional development plan for teachers. As a result, data-driven professional development is an integral part of the total school improvement effort, with the ultimate measure of success being student achievement. It is essential that professional development is provided for administrators to increase their knowledge about math to strengthen instructional leadership.

Individual Professional Growth Plans for Staff Members

Self-reflection is an important part of ongoing professional development for teachers and staff. Providing a structured professional growth plan based on observations and individual staff needs helps with increasing student outcomes. Professional growth plans should be aligned to the district and program professional development plans and personalized to the needs of each teacher. The plan includes objectives or goals, learning activities, needed resources, and plans for self-evaluation. The implementation of the plan is monitored and results are reviewed periodically, then the plan is revised and refined as needed. Information is gathered on the teacher's professional growth, as well as changes in student learning. Evaluation information might include the teacher's reflective writing about their own learning, classroom observation documentation, student achievement data, and artifacts of student work. Administrators conduct portfolio conferences when teachers believe they have completed their goal. During the conference, the teacher reflects on activities completed, learning that has taken place, and future directions for professional growth. An individual growth plan is created to help a teacher's practice grow and change, not as an evaluation or accountability tool.

Professional Development for New Teachers

Coordinating support for new teachers should include resources, strategies, and practices for understanding the school operations and community. Although teacher ability is not the only factor that plays into students' success in school, studies have shown that students with more experienced and better trained teachers tend to do better in school. Schools that have mentoring and peer network

processes for new teachers to engage in discussion, self-reflection, and planning with experienced teachers improve teacher performance, as well as the new teachers' professional well-being.

Where to find Professional Development

As part of the Office of Public Instruction's (OPI) service to Montana schools, the Learning Opportunities Portal provides information about high quality professional development happening across the state. The portal shares a variety of workshops and trainings provided by Montana's many professional development providers: http://www.mtplportal.org.

Free, Online Professional Development

The OPI Teacher Learning Hub is an online learning network dedicated to providing free, high quality professional development for all K-12 educators across Montana. It aims to minimize the time teachers spend away from their classrooms to attend training, as well as save school districts money on professional development: http://www.opi.mt.gov/learninghub.

High-performing schools are characterized by the following Professional Development Subcomponents. (See Appendix A for complete self-assessment.)

Professional Development	
1. Professional development is aligned to the MCCS and is provided for staff across all content areas on explicit and systematic instruction in numeracy, thoughtful planning around clusters, essential and supporting standards and disciplinary reading, writing, listening, and speaking in mathematics.	1 2 3 4 5
2. Ongoing, job-embedded professional learning is provided in many ways to meet varying staff needs (e.g., coaching, professional learning communities, peer mentoring, Web-based).	1 2 3 4 5
3. Instructional Leaders use multiple sources of student and school data when planning and implementing professional development.	1 2 3 4 5
4. Individual, targeted professional growth plan structures are in place for staff based on observation data and staff needs.	1 2 3 4 5
5. Structures are in place for providing professional development for new staff members.	1 2 3 4 5
Action Ideas for Professional Development:	

Professional Development Summary

Professional Development

Successful schools use high quality professional development that is ongoing and embedded in a teacher's work day: opportunities for PLCs, coaching, partnering, and mentoring are effective tools for increasing the effectiveness of professional development. More information is available in the full Mathematics Plan.

A Note on the Math Standards and Professional Development

The MCCS for mathematics has set a higher bar for student learning expectations and changed some of the math learning progressions. For this reason, teachers may have to address math topics they haven't worked with before. Teachers should look at the new standards and determine if math content professional development would benefit their practice.

Themed Professional Development

It is unrealistic to expect a teacher to change more than 10 percent of their practice in a given year. That being said, it is unprofessional for that same teacher to not change their practice by 10 percent in that year. (Leinwand, 2015) It is important for a school to choose a theme to focus on for the year's professional development. A professional development plan that lacks focus and coherence can distract and frustrate teachers.

Where to find Professional Development

As part of OPI's service to Montana schools, the Learning Opportunities Portal provides information about high quality professional development happening across the state. The portal shares a variety of workshops and trainings provided by Montana's many professional development providers: http://www.mtplportal.org.

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System-Wide Commitment

Defined: System-Wide Commitment refers to the commitment of working with all partners within a system to create local capacity for sustained professional support and professionalism and to build capacity for continuous improvement for all students with equity and access.

Instructional Leaders Set Measurable Goals

Long-term improvements in student achievement and school improvement depend on strategic planning and goal-setting at the system level. Strong collaborative leadership at all levels of schooling, birth through grade 12, is perhaps the single most important determining factor in successfully implementing and sustaining educational changes. (Alabama Literacy Team, 2012) Improving achievement requires clear, measurable learning goals for students and educators throughout the system.

Many schools use identifiable goals that are not necessarily easy to measure but still hold significant importance for students requiring a balanced approach to mathematics:

- Think and reason effectively.
- Solve problems accurately, flexibly, and efficiently.
- Communicate clearly using mathematical language and representations.
- Demonstrate skills and knowledge of performance assessments as well as standardized tests.
- Develop a productive disposition. (Aguirre, J; Mayfield-Ingram, K; & Martin, D.B., 2013)

Community-Based, Collaborative Partnerships Support Mathematics Development

A system-wide commitment requires a shared responsibility through building partnerships. These partnerships are built within the system, across schools, and with parents, communities, and other organizations and agencies to build shared involvement in, and responsibilities for, supporting student learning. (Fullan, 2006) Strong partnerships are built through clear communication. Clear communication with a consistent message is essential when communicating about raising student achievement. Communication needs to occur widely, frequently, and with a sense of urgency.

Common Learning Opportunities for all Mathematics Stakeholders

Smooth transitions are essential to student achievement. An integrated professional development system of preparation and ongoing development and support that crosses sectors (e.g., childcare, Head Start, and public schools) provides learning opportunities for all mathematics stakeholders. With an integrated, cross-sector approach to learning opportunities, staff members are adequately prepared to support all students for transitions from one setting to the next.

Collaboration with Mathematics Stakeholders Includes Sharing Assessment Results

Collaboration with all mathematics stakeholders includes sharing of individual assessment results as students transition from one setting to the next. Systematically using student achievement data from formative and summative assessments at the class, center, school, district, and state level help staff focus instructional improvement decisions for targeting intervention support.

In order to use assessment data most effectively, a comprehensive assessment system needs a management plan at the school or center level. Finding an efficient way to manage and use the data is as essential as gathering the data in the first place. Once a management plan is in place, student data is easily accessed and used for support and during transition periods. Suggestions for sharing individual assessment data for smooth transition are as follows:

- Formative and summative data should be kept in individual cumulative student files that move from one year to the next. This data is used by teachers, data-teams, and intervention teams to make instructional decisions for student placement and intervention.
- Cumulative data information is passed on during the important transition stages of students' education. These transition times are likely to be:
    - Transition from preschool to kindergarten.
    - Transition from primary grades to intermediate grades.
    - Transition from intermediate grades to middle school.
    - Transition from middle school to high school.
    - Transition from high school to post-secondary, as necessary.

Collaboration with Mathematics Stakeholders Includes Communication about Intervention Services

A strong link has been established between the quality of instruction and student performance. "Access to instructional content is always more strongly related to differences in student performance than are the student background factors often cited to explain such differences." (Schmidt, W. H. & Cogan, L. S., 2009) Through a system-wide commitment, coordinated supports are achievable. Coordinated supports are the resources, strategies, and practices that schools, families, and communities provide to enable all students to have an equal opportunity for success at school. When instructional efforts and interventions are integrated with coordinated supports, barriers to teaching and learning are broken down. Coordinated support and adequate resources are essential to ensure that high-quality classroom instruction occurs in every classroom, resulting in increased achievement for all students.

Long-term improvements in student achievement and school improvement depend on strategic planning and goal-setting at the system level.

System-Wide Commitment	
1. Instructional leaders set regularly updated measurable goals for systemic academic improvement and monitor progress toward these goals annually.	1 2 3 4 5
2. Community-based, collaborative partnerships coordinate services to support mathematics development of students (e.g., participate on mathematics leadership team, plan shared professional development, and participate in state-provided professional development).	1 2 3 4 5
3. Common learning opportunities are provided for all mathematics stakeholders to ensure smooth transitions as students move from one mathematics setting to the next (e.g., preschool to kindergarten and school to school).	1 2 3 4 5
4. Collaboration with all mathematics stakeholders includes sharing of school and classroom vision and goals, as well as individual assessment results for each student as they transition from one mathematics setting to the next.	1 2 3 4 5
5. Collaboration with all mathematics stakeholders includes communication about children who are likely to need intervention services when they transition from one mathematics setting to the next.	1 2 3 4 5

Community and Family Partnerships

Defined: Community and family partnerships serve to promote and support the social, emotional, physical, academic, and occupational growth of children. A successful community and family partnership require meaningful collaboration among youth, families, schools, employers, and agencies. "*Partnering with parents and community groups from out-of-school settings can provide children with additional opportunities to deepen their conceptual understanding of mathematics and develop positive mathematics identities."* (Aguirre, J; Mayfield-Ingram, K; & Martin, D.B., 2013)

Community stakeholders are organizations that can serve as instructional resources to support mathematic learning. In order to create a partnership with community organizations and make that partnership work, it is essential to build strong communications among all the participants and those who will be affected by the partnership. Stakeholders may include educators, families, community organizations, businesses, early childhood and local education agencies, higher education, and/or unions. The levels of communication may vary among these stakeholders, depending on the circumstances and purpose of the message. The highest level of communication is achieved through collaboration toward solving school/community issues and the sharing of expertise and resources.

Communication and Collaboration

Studies show that school and community relationships have positive results on students from all racial, socioeconomic, and education backgrounds. Due to a wide range of barriers and individual differences, schools and communities should allow for participation in various ways, at different levels of commitment, and at different frequencies. (Louisiana Department of Education, 2011) It is important that school and district leaders and staff members establish a communication plan for sharing mathematic vision, expectations, strengths, and needs to all stakeholders and collaborate to meet desired outcomes.

Collaborative Partnerships to Ensure Supportive Transitions

It is the responsibility of all community-based, collaborative partnerships to ensure supportive transitions for students from one mathematic setting to the next (e.g., local engineering firms support school mathematic events; school encourages participation in summer mathematic programs). Community-based partnerships and local resources should be recognized and encouraged to be actively involved in all local and school mathematic activities. Schools should strive to create a coordinated system of support that links families with local community resources and provides greater support for students in achieving mathematic skills for college and career readiness.

Culturally and Linguistically Sensitive Partnerships

Parents and families need to be engaged as partners in ways that are culturally and linguistically sensitive. A family's involvement in their child's education is recognized as an important factor in school success and achievement. Research has shown that not only does family involvement increase

academic achievement, as reflected in higher test scores and graduation rates, but increases the likelihood that youth will pursue higher education. (Henderson, A. T. & Berla, N. , 2001) Yet, many families need assistance to be able to actively participate in their child's education. Successful schools help families become active participants by supporting families in feeling welcomed, valued, and connected to each other, to the staff, and to what their child is doing in school.

Shared Information about Mathematic Expectations

Parents and families should be informed of both the schoolwide and individual classroom mathematic vision, goals, and expectations as outlined in the Montana Common Core Standards (MCCS) and be updated regularly on their child's progress toward meeting those expectations.
Communication should:

- Raise awareness of the role that mathematics play in the future.
- Provide strategies and materials to support mathematics learning at home.
- Provide all with the understanding and tools to advocate for mathematics education.
- Increase conceptual understanding of mathematics content.

Updates on Individual Student Progress

Parents and families are updated on a child's individual progress at least three times a year. For those students receiving Tier 2 and 3 interventions, progress toward meeting those expectations is shared at least six times a year.

For a more detailed description of these interventions, refer to the Instruction and Intervention section of the Montana Mathematic Plan.

Community Mathematic Resources Must Be Available to Families

The nation's schools must improve education for all children, but schools cannot do this alone. More will be accomplished if schools, families, and communities work together to promote successful students. (Epstein, J. L; Sanders, M. G; Simon, B. S; Clark-Salina,K; Rodriquez-Jansorn, N. & Van Voorhis, F. L., 2002)

The Epstein model of *Six Types of Involvement* emphasizes three overlapping spheres of influence on student development: family, school, and community. These spheres can collaborate in six key ways to foster a caring community that children need to maximize their potential in school and in later life:

1. **Parenting:** Assist families with parenting and child-rearing skills, understanding child and adolescent development, and setting home conditions that support children as students at each age and grade level. Assist schools in understanding families. This type of involvement ties to the subcomponent, *"A coordinated system of support links families with local community resources to provide greater support for students in achieving mathematic skills for career and college readiness."*

2. **Communicating:** Communicate with families about school programs and student progress through effective school-to-home and home-to-school communications. This type of involvement ties to the subcomponent, *"Instructional leaders communicate mathematic goals and expectations to stakeholders and collaborate to meet desired outcomes."*
3. **Volunteering:** Improve recruitment, training, work, and schedules to involve families and community members as volunteers and audiences at the school or in other locations to support students and school programs. (Henderson, A. T. & Berla, N. , 2001) This type of involvement ties to the subcomponent, *"Families are welcomed as volunteers."*
4. **Learning at home:** Involve families with their children in learning activities at home, including homework and other curriculum-linked activities and decisions. Instructional leaders communicate mathematic goals and expectations to stakeholders and collaborate to meet desired outcomes. This type of involvement ties to the subcomponent, *"Instructional leaders communicate mathematic goals and expectations to stakeholders and collaborate to meet desired outcomes."*
5. **School decision-making:** Include families as participants in school decisions, governance, and advocacy through PTA/PTO, school councils, committees, and other parent organizations. This type of involvement ties to the subcomponent, *"Parents and families are engaged as partners in ways that are culturally and linguistically sensitive."*
6. **Collaborating with the community:** Coordinate resources and services for families, students, and the school with businesses, agencies, and other groups, and provide services to the community. This type of involvement ties to the subcomponent, *"Local resources that support mathematic activities are recognized and encouraged."*

Students of all ages, genders, socioeconomic status, and abilities do better in school when their families are actively involved. These students typically earn better grades, enroll in higher-level programs, have higher graduation rates, and are more likely to enroll in postsecondary education. Middle- and high-school students from involved families make better transitions, maintain the quality of their work, develop realistic plans for the future, and are less likely to drop out. (Epstein, 2010)

High-performing schools are characterized by the following Community and Family Involvement Subcomponents. (See Appendix A for complete self-assessment.)

Community and Family Partnership	
1. Instructional leaders communicate mathematics vision, goals, and expectations to stakeholders and collaborate to meet desired outcomes (e.g., stakeholders may include educators, families, community organizations, businesses, early childhood and local education agencies, higher education, and unions).	1 2 3 4 5
2. Community-based, collaborative partnerships ensure supportive transitions from one mathematics setting to the next.	1 2 3 4 5
3. Parents and families are engaged as partners in ways that are culturally and linguistically sensitive.	1 2 3 4 5
4. Parents and families are informed of mathematics vision, goals, and expectations outlined in the MCCS and are updated on individual student progress toward meeting those expectations a minimum of three times per year.	1 2 3 4 5
5. Parents and families with students receiving Tier 2 and 3 interventions are updated on individual student progress toward meeting expectations outlined in the MCCS a minimum of six times per year.	1 2 3 4 5
6. A coordinated system of support links families with local community resources to provide greater support for students in achieving mathematics skills for career and college readiness.	1 2 3 4 5
7. Families and community members are welcomed as volunteers to maximize student mathematics learning.	1 2 3 4 5
8. Local resources that support mathematics activities are recognized and encouraged by staff and instructional leaders.	1 2 3 4 5
Action Ideas for Community and Family Involvement:	

Community and Family Partnership Summary

Community and family practice has three vital elements:

1. Meaningful collaboration among youth, families, schools, employers, and agencies.
2. Promotion and support of the social, emotional, physical, and occupational growth of children.
3. Availability of resources.

Community Stakeholders are organizations that may serve as instructional resources to support mathematic learning.

Studies show that school and community relationships have positive results on students from all racial, socioeconomic, and education backgrounds. Communication and collaboration are keys to this success.

Collaboration*:*

1. Collaborative partnerships link families with community resources.
2. Provides assistance for family involvement, which increases academic achievement and honors diversity within the community.

Communication should:

1. Raise awareness of the role that mathematics play in the future.
2. Provide strategies and materials to support mathematics learning at home.
3. Provide all with the understanding and tools to advocate for mathematics education.
4. Increase conceptual understanding of mathematics content.

Three Spheres of Influence:

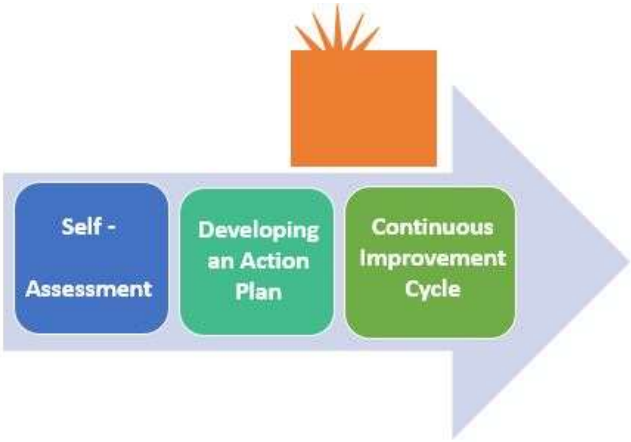
Family, school, and community are three spheres of influence on student academic achievement that can collaborate in many ways. Epstein identifies *Six Types of Involvement* that foster a caring community in which children flourish:

1. Parenting
2. Communicating
3. Volunteering
4. Learning at home
5. School decision-making
6. Collaborating with the community

Students of all ages, genders, socioeconomic status, and abilities do better in school when families are actively involved. These students typically earn better grades, enroll in higher-level programs, have higher graduation rates, and are more likely to enroll in postsecondary education. Middle- and high-school students from involved families make better transitions, maintain the quality of work, develop realistic plans for the future, and are less likely to drop out. (Epstein, 2010)

Systemic Processes for Improving Mathematics Outcomes

A comprehensive mathematics plan should outline systemic processes for improving student mathematics outcomes and must include a comprehensive assessment system to drive the decision-making and action goal setting. It's important to understand that continuous mathematics improvement is a multifaceted system that combines infrastructure with intentionality that promotes responsibility and commitment for supporting mathematics development. To ensure the successful implementation of the Continuous Improvement Components (CICs) it is recommended that districts and schools implement a variety of systemic processes. These processes are designed to mirror the student assessments (outcomes, screening, benchmark, and progress monitoring) identified in the assessment section of the Montana Mathematics Plan (MMP). The Electronic Self-Assessment for Mathematics (ESA-M) serves as screening and benchmark measures. The action plan, continuous improvement cycle, and inventory serve as the progress monitoring measures, and the end of year cumulative action plan and completed continuous improvement cycle serve as the outcome measures. The systemic processes will ensure the staff is working together to explore and implement the CICs in order to increase student achievement and ensure a sustainable comprehensive mathematics plan.



Process of Electronic Self-Assessment (ESA)

The ESA-M instrument (Appendix A) outlines the key CIC subcomponents that are proven to be effective indicators for increasing student mathematics outcomes. It is designed to be used by district or school personnel to assess the mathematics processes used for increasing student mathematics outcomes. Information gathered through the ESA-M will help school leadership teams determine the current phase: exploring, beginning to be implemented, implementing, beginning to be sustained, or sustaining.

The ESA-M helps districts and schools identify strengths and weaknesses for each CIC subcomponent. It is recommended that the district or school:

- complete the ESA;
- determine next steps and requirements needed to implement an effective mathematics action plan;
- share the results with the staff and community to obtain buy-in to ensure capacity for implementation; and
- use the ESA as a framework for the district and school mathematics plan.

ESAs serve to identify what a model implementation looks like and what needs should be put into action. This systemic process will be valuable for all districts and schools because the ESA will provide a clear description of differences between existing practices and the CIC subcomponents. The CIC subcomponents are evidence-based exemplars.

Staff will rate the extent of the implementation of the CIC subcomponents that help achieve increased student mathematics outcomes. Districts may find themselves at various phases of a CIC subcomponent. These phases begin with *exploring***,** move toward *implementing,* and finally reach *sustaining***,** a phase in which the CIC subcomponent is firmly embedded into daily practice within the district or program.

Exploring: A CIC subcomponent that is in the exploring stage is still in the planning stages of execution. These CIC subcomponents are just being investigated by personnel and further action is needed. A rating of 1 indicates the CIC subcomponent is not being implemented but might be explored at this time.

Beginning to be implemented: A CIC subcomponent that was introduced is beyond the explore phase, but barely being utilized across the system. A rating of 2 indicates the CIC subcomponent is in the beginning stages of implementation.

Implementing: A CIC subcomponent that has been introduced and is being utilized in many ways across the system may be in the implementing phase. These CIC subcomponents are sometimes being implemented by most staff, but further action is needed. A rating of 3 indicates the CIC subcomponent is being implemented but isn't a sustained practice.

Beginning to be sustained: A CIC subcomponent that is being implemented and moving toward beginning a sustained practice by all educational stakeholders. A rating of 4 indicates an inconsistent implementation of the CIC subcomponent.

Sustaining: A CIC subcomponent that is at the sustaining phase has become part of the regular routine, and protocols have been embraced by all educational stakeholders involved within the educational system. A rating of 5 indicates sustained, consistent implementation of the CIC subcomponent.
Using the ESA-M as a *screening* instrument will allow districts and schools to more effectively write their school action plan to determine the exact support needed. It is recommended that the ESA-M be administered during three *benchmark* periods (fall, winter, spring) to determine how much progress each district or school is making in reaching the sustaining phase.

Process of Developing an Action Plan

Appendix B provides an MMP Action Planning Template for districts and education programs to utilize. School leadership teams are encouraged to identify the current phase of the CIC subcomponents and decide which areas are in further need of action.

Consider the following questions when planning action steps for the continuous mathematics improvement CIC subcomponents for improving student mathematics outcomes.

- What current practices or processes need to be adjusted and how?
- What new practices, processes, or strategies will strengthen our current implementation?

School leadership teams will identify three to five action plan goals and decide on specific action steps in order to achieve the goal. The team will define what is to be done, who will be responsible for each action step, and delineate a timeframe for completion of the goal.

Action plans serve as progress monitors for districts and schools. Paul Schlechty (2001) states, "Two things sustain change: one is a leader or leadership group that acts as a change agent; the other is a system or group of systems that supports change." (Schlechty, 2002, p. 40) This explains why, when the school culture does not have the capacity to sustain a change effort, "the change rarely outlasts the tenure of the change agent." (p. 40) A key leadership task, then, is to study and create system conditions that will support and sustain change through systemic sustainable processes. These suggestions are meant to provide guidance for school leadership teams in the development or continued implementation of a comprehensive mathematics plan; however, each educational setting is unique, so working through this process should be a starting point for important conversations for capitalizing on the resources distinctive to your educational setting.

Process of Problem Solving: Continuous Improvement Cycle

The Continuous Improvement Cycle (Appendix C) is a problem-solving model that translates decisions into data-informed action steps. Although the process is conceptualized as a sequential pattern since each step serves as a logical basis for the next, the process is also cyclical. The cyclical pattern begins with the development of a decision strategy that includes deliberate, purposeful action plan goals and moves through implementation and ongoing monitoring of results. (Litchfield, 1956) Many decision-making action cycles may be occurring simultaneously. The cycle includes the following steps:

1) Assess the current situation
2) Develop a plan of change
3) Implement the plan
4) Monitor the plan
5) Monitor the impact of the plan

6) Review the new data
7) Revise and refine the plan

As part of the Continuous Improvement Cycle, school leadership teams will continually *monitor the progress* of the action goals utilizing data to inform additional decision making. The Action Plan document can serve as a guide as well as a record of what has been planned and what has been accomplished toward each component of the MMP. This will allow districts to continually reassess their next steps as part of the continuous improvement cycle. The Action Plan can continually be addressed by re-examining needs and accomplishments. Then, next steps can be created with accountability (what, who, when). It is important to continually evaluate Action Plans to assure that programs are making progress toward meeting goals and to provide support in the continuous school improvement cycle.

APPENDICES

Appendix A: Continuous Mathematics Improvement Self-Assessment

The self-assessment instrument is designed to be used by education programs and school districts to assess the mathematics processes used for increasing student mathematics outcomes. Mathematics is defined as the understanding of numbers, equations, functions, and geometric shapes and their relationships. A comprehensive mathematics plan should outline the school's systemic processes for improving student mathematics outcomes and should include a comprehensive assessment system.

The Montana Mathematics Plan (MMP) outlines specific Continuous Improvement Components (CIC) proven to be effective indicators for increasing student mathematics outcomes. Rate the extent of the implementation of the subcomponents that help achieve increased student mathematics outcomes in your education setting. A rating of 1 indicates the subcomponent is not being implemented but possibly being explored at this time, and a rating of 5 indicates sustained consistent implementation of the sub-component.

Instructional Leadership ← 1 Exploring	2 Beginning to be Implemented	3 Implementing	4 Beginning to be Sustained	5 Sustaining →	
1.	Instructional leaders support and monitor all instruction and intervention expectations.				1 2 3 4 5
2.	Instructional leaders have established measurable goals for academic improvement that explicitly align to the Montana Common Core Standards (MCCS) and monitor progress toward these goals.				1 2 3 4 5
3.	Instructional leaders meet regularly to analyze school and student data to inform and convey decisions about professional development, instruction, and intervention.				1 2 3 4 5
4.	Instructional leaders communicate a shared responsibility for student mathematics outcomes.				1 2 3 4 5
5.	Instructional leaders engage leaders across the school community in continuous mathematics improvement planning.				1 2 3 4 5
6.	Adequate fiscal resources are provided to support mathematics improvement efforts.				1 2 3 4 5
7.	Instructional leaders establish, support, and lead a mathematics leadership team.				1 2 3 4 5
8.	Instructional leaders have established a culture of collaboration among staff with a focus on mathematics achievement and effective mathematics instruction.				1 2 3 4 5

Action Ideas for Leadership:	
Standards **The Montana Common Core Standards (MCCS) Stages of Implementation Continuum** include six stages, which provide comprehensive resources for school districts to self-assess readiness, create action plans, and access targeted resources and processes for aligning curriculum, instruction, and assessment. www.opi.mt.gov/MontanaCommonCoreStandards	
1. Stage 1: The MCCS for each grade and subject area have been thoroughly studied and are understood.	1 2 3 4 5
2. Stage 2: Curriculum has been aligned with the MCCS.	1 2 3 4 5
3. Stage 2: Instructional materials are aligned with the MCCS.	1 2 3 4 5
4. Stage 3: Assessments are aligned with curriculum and with the MCCS.	1 2 3 4 5
5. Stage 4: A comprehensive scope and sequence is communicated and aligned to the MCCS.	1 2 3 4 5
6. Stage 4: A pacing guide outlines a consistent instructional timeline and is adhered to by all staff.	1 2 3 4 5
7. Stage 5: Educators engage in horizontal (e.g., grade level) and vertical (e.g., cross-grade level) alignment of curriculum and assessments.	1 2 3 4 5
8. Stage 6: Educators have analyzed assessment results (e.g., Smarter Balance, curriculum assessments, and independent progress monitoring assessments) and processes are established to make systematic changes based on data results.	1 2 3 4 5
Action Ideas for Standards:	
Instruction and Interventions	
1. Instructional materials and content are aligned to the MCCS.	1 2 3 4 5
2. Instructional materials and content include explicit and systematic instruction in numeracy, thoughtful planning around clusters, essential and supporting standards and disciplinary reading, writing, listening, and speaking in mathematics.	1 2 3 4 5
3. Instructional leaders ensure time and access for mathematics instruction during the school day is a priority and adequate time and scheduling for mathematics interventions.	1 2 3 4 5
4. Tiered instruction is clearly defined and implemented with fidelity.	1 2 3 4 5

5. Additional support is provided for learners with Tier 2 and Tier 3 needs through intensified interventions (e.g., smaller groups sizes, increased time, or varied instructional materials).	1 2 3 4 5
6. Instructional leaders ensure that instructional materials are readily available for all instruction and intervention settings.	1 2 3 4 5
7. Technology is utilized to support student learning (e.g., software or digital devices that students use to learn, access, organize, and communicate information).	1 2 3 4 5
Action Ideas for Instruction and Intervention:	
Assessment and Data-Based Decision Making	
1. Assessment tools and procedures align to the MCCS.	1 2 3 4 5
2. Comprehensive assessment system includes both formative and summative assessments.	1 2 3 4 5
3. Collaborative teams use a specific protocol for examining student data and making instructional and intervention decisions (e.g., universal screening, progress monitoring, diagnostic, and outcome measures are defined by when, who, and where).	1 2 3 4 5
4. Data is disaggregated by subgroups and provided to educators for instructional decision making in a timely and efficient manner.	1 2 3 4 5
5. A comprehensive plan assesses the effectiveness of the instructional program and guides adjustments for improvement.	1 2 3 4 5
6. Regularly scheduled data analysis discussions occur to assess and adjust ongoing learning (e.g., biweekly grade level meetings or data meetings).	1 2 3 4 5
7. A data collection system is in place and technology support is available for continuous access of the data system.	1 2 3 4 5
8. Assessors receive professional development on valid and reliable assessment administration and fidelity of assessment administration is verified (e.g., checklists, observations).	1 2 3 4 5
Action Ideas for Data-Based Decision Making:	

Professional Development	
1. Professional development is aligned to the MCCS and is provided for staff across all content areas on explicit and systematic instruction in numeracy, thoughtful planning around clusters, essential and supporting standards, and disciplinary reading, writing, listening, and speaking in mathematics.	1 2 3 4 5
2. Ongoing, job-embedded professional learning is provided in many ways to meet varying staff needs (e.g., coaching, professional learning communities, peer mentoring, Web-based).	1 2 3 4 5
3. Instructional leaders use multiple sources of student and school data when planning and implementing professional development.	1 2 3 4 5
4. Individual, targeted professional growth plan structures are in place for staff based on observation data and staff needs.	1 2 3 4 5
5. Structures are in place for providing professional development for new staff members.	1 2 3 4 5
Action Ideas for Professional Development:	
System-Wide Commitment	
1. Instructional leaders set regularly updated, measurable goals for systemic academic improvement and monitor progress toward these goals annually.	1 2 3 4 5
2. Community-based, collaborative partnerships coordinate services to support mathematics development of students (e.g., participate on mathematics leadership team, plan shared professional development, and participate in state-provided professional development).	1 2 3 4 5
3. Common learning opportunities are provided for all mathematics stakeholders to ensure smooth transitions as students move from one mathematics setting to the next (e.g., preschool to kindergarten and school to school).	1 2 3 4 5
4. Collaboration with all mathematics stakeholders includes sharing of school and classroom vision and goals, as well as individual assessment results for each student as they transition from one mathematics setting to the next.	1 2 3 4 5
5. Collaboration with all mathematics stakeholders includes communication about children who are likely to need intervention services when they transition from one mathematics setting to the next.	1 2 3 4 5

Action Ideas for System-Wide Commitment:	
Community and Family Partnership	
1. Instructional leaders communicate mathematics vision, goals, and expectations to stakeholders and collaborate to meet desired outcomes (e.g., stakeholders may include educators, families, community organizations, businesses, early childhood and local education agencies, higher education, and unions).	1 2 3 4 5
2. Community-based, collaborative partnerships ensure supportive transitions from one mathematics setting to the next.	1 2 3 4 5
3. Parents and families are engaged as partners in ways that are culturally and linguistically sensitive.	1 2 3 4 5
4. Parents and families are informed of mathematics vision, goals, and expectations outlined in the MCCS and are updated on individual student progress toward meeting those expectations a minimum of three times per year.	1 2 3 4 5
5. Parents and families with students receiving Tier 2 and 3 interventions are updated on individual student progress toward meeting expectations outlined in the MCCS a minimum of six times per year.	1 2 3 4 5
6. A coordinated system of support links families with local community resources to provide greater support for students in achieving mathematics skills for career and college readiness.	1 2 3 4 5
7. Families and community members are welcomed as volunteers to maximize student mathematics learning.	1 2 3 4 5
8. Local resources that support mathematics activities are recognized and encouraged by staff and instructional leaders.	1 2 3 4 5
Action Ideas for Community and Family Involvement:	

Appendix B: Montana Mathematics Plan Action Planning Template

Consider the following questions when planning action steps for the CICs for improving student mathematics outcomes.

- What current practices or processes will be adjusted and how?
- What new practices, processes, or strategies will strengthen our current implementation?

School:	Consultant:	Date:
Continuous Improvement Components:		
Action Goal		
Action Steps		
Person(s) Responsible	Resources Needed	Timeline
Continuous Improvement Components:		
Action Goal		
Action Steps		
Person(s) Responsible	Resources Needed	Timeline

Appendix C: Continuous Improvement Cycle

Appendix D: Graduation Matters Montana (GMM)

More than 1,500 Montana students drop out of school each year. Since the launch of Graduation Matters Montana, the statewide dropout rate is on the decline, and the graduation rate has gone up. Montana's high school dropout rate has decreased from 5 percent in 2009 to 3.4 percent in 2015, and the graduation rate has increased from 80.7 percent in 2009 to 86 percent in 2015. This is the highest the graduation rate has been in Montana since the Office of Public Instruction (OPI) began calculating the graduation rate in 2000.

The Montana Mathematics Plan (MMP) supports the goals of Graduation Matters Montana (GMM) by setting an expectation for every child in Montana to graduate from high school.

Page 5 in *Starting a Graduation Matters Montana Toolkit* includes a checklist for launching an initiative.

Checklist for Launching a Graduation Matters Initiative

Step 1: Start a Graduation Matters Team

- Make sure the GMM team is comprised of students, educators, parents, and community members.
- Convene the first GMM meeting. Begin identifying goals that are specific to the community.

Step 2: Know the Data

- Contact the OPI for data specific to a district or school.
- Use the data tables included in the toolkit to develop the school's three-year dropout snapshot, college-going and remediation rates, and review statewide comparison.
- Review the information with the GMM team and discuss.

Step 3: Implement Specific Research-Based Strategies

- Learn which programs the school district already have in place for dropout prevention.
- Identify what the community is already doing and prioritize the next steps by using the comprehensive community solutions table to take an inventory of "what is."
- Implement new strategies that work to lower the dropout rate and increase college and-career-readiness.

Step 4: Build Support and Keep the Community Informed and Involved

- Set goals for the GMM team and hold meetings regularly.

- Raise public awareness of the community's GMM plan.
- Plan an *"I Pledge to Graduate"* event and invite the media.
- Celebrate!

Schools with GMM initiatives should include at least one member of the instructional leadership team to ensure continuity and support, especially in knowing the data and implementing specific research-based strategies: both critical processes in the MMP.

The components of the MMP (leadership, instruction and intervention, assessment and data-based decision making, professional development, system-wide commitment, community and family partnerships, and the Montana Common Core Standards) include many of the same components as GMM.

For additional information on Graduation Matters Montana, visit http://graduationmatters.mt.gov/.

Appendix E: Indian Education for All (IEFA)

Indian Education for All is an educational mandate derived from Montana's state constitution, which reads, "It is the intent of the legislature that every Montanan, whether Indian or non-Indian, be encouraged to learn about the distinct and unique heritage of American Indians in a culturally responsive manner … all school personnel should have an understanding and awareness of Indian tribes to help them relate effectively with Indian students and parents … educational personnel provide means by which school personnel will gain an understanding of and appreciation for the American Indian people."

Montana Code Annotated (MCA) 20-1-501
In order to fulfill this mandate, teachers should carefully plan ways in which to integrate the Seven Essential Understandings Regarding Montana Indians throughout the curriculum.

Essential Understanding 1: There is great diversity among the 12 Tribal Nations of Montana in their languages, cultures, histories, and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Essential Understanding 2: There is great diversity among individual American Indians as identity is developed, defined, and redefined by many entities, organizations, and people. There is a continuum of Indian identity ranging from assimilated to traditional and is unique to each individual.

Essential Understanding 3: The ideologies of native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs. Additionally, each tribe has its own oral history, beginning with their origins that are as valid as written histories. These histories pre-date the "discovery" of North America.

Essential Understanding 4: Reservations are lands that have been reserved by the tribes for their own use through treaties and were not "given" to them. The principle that land should be acquired from the Indians only through their consent with treaties involved three assumptions:

- Both parties to treaties were sovereign powers.
- Indian tribes had some form of transferable title to the land.
- Acquisition of Indian lands was solely a government matter not to be left to individual colonists.

Essential Understanding 5: There were many federal policies put into place throughout American history that have impacted Indian people and shaped who they are today. Much of Indian history can be related through several major federal policy periods:

- Colonization/Colonial Period 1492-1800s
- Treaty Period 1789-1871
- Assimilation Period—Allotment and Boarding School 1879-1934

- Tribal Reorganization Period 1934-1958
- Termination and Relocation Period 1953-1971
- Self-determination Period 1968-Present

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. Histories are being rediscovered and revised. History told from an Indian perspective conflicts with what most of mainstream history tells us.

Essential Understanding 7: Under the American legal system, Indian tribes have sovereign powers, separate and independent from the federal and state governments. However, the extent and breadth of tribal sovereignty is not the same for each tribe.

For a full description of each understanding, go to Indian Education for All, Essential Understandings.

Web site: http://www.opi.mt.gov/PDF/IndianEd/Resources/EssentialUnderstandings.pdf
Additional Resources: http://www.opi.mt.gov/Programs/IndianEd/index.html

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