STRENGTHENING STUDENT EDUCATIONAL OUTCOMES

Mathematics Menu of Best Practices and Strategies

2020

Washington Office of Superintendent of
PUBLIC INSTRUCTION

Mathematics: Menu of Best Practices and Strategies

2020

Authorizing legislation: RCW 28A.165.035

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Washington Office of Superintendent of PUBLIC INSTRUCTION

Table of Contents

Welcome

Students throughout the state of Washington receive tutoring, extra classes, summer programs and other interventions with the help of funds from the Learning Assistance Program (LAP). The state of Washington invests several hundred million dollars per year in LAP to help students meet grade-level standards. About 15.5 percent of students statewide are served by LAP.

In 2013, the Legislature passed a bill (ESSB 5946) requiring the Office of Superintendent of Public Instruction (OSPI) to improve the LAP system and K–4 literacy outcomes. Now, OSPI convenes expert panels annually to identify the practices that best help students grow and succeed academically. Their work informs the Menus of Best Practices for Mathematics, English Language Arts (ELA), and Behavior. Each year, districts report on the academic growth of students receiving LAP services. Districts can either use the best practices from the menus, or provide data showing that their alternative practices are effective in achieving student growth. These provisions are detailed in RCW 28A.165.

The Legislature also passed a companion bill authorizing the Washington State Institute for Public Policy (WSIPP) to identify evidence-based and research-based best practices for student interventions. OSPI and WSIPP annually collaborate on the development of the Menus of Best Practices for ELA, Mathematics, and Behavior.

We know an opportunity gap exists among different student populations. Poverty is a striking example of a factor that can significantly disrupt a student's learning. Students learning English as an additional language face the task of learning a new language and new academic content at the same time. Students who have or are experiencing trauma may exhibit behavioral anomalies which can interrupt their academic progress. Teachers are actively seeking ways to better support all students. Throughout the menus, the expert panels have identified best practices shown to reduce the opportunity gap among all students.

This report contains not only the menu of best practices, but also foundational content describing Washington state's mathematics landscape and other initiatives designed to improve mathematics concepts and skills for all students. It describes how a Multi-Tiered System of Supports (MTSS) framework is critical for implementing a high-achieving educational system. It also explains how assessment data and reporting serve to continuously improve LAP and student outcomes. We have included a rich set of resources and references for those who wish to further explore the identified best practices.

We are starting to see the promise in this focused partnership between districts, Educational Service Districts (ESDs), OSPI, WSIPP, and the Legislature. This is the fifth year the mathematics menu has been published, and each year the professionals who comprise the panel search the current literature for proven interventions, make improvements to the existing practices, and provide additional advice and support to teachers, student support staff, and school administrators who are implementing LAP with their students.

"We have a duty to educate all students. Collecting the best strategies that districts use to reach those who need extra help is a great step toward meeting that responsibility."

Chris Reykdal, State Superintendent of Public Instruction

We thank you for your thoughtful read of this menu and for your ongoing commitment to serve students who need support the most.

The Learning Assistance Program Team
Office of Superintendent of Public Instruction
June 2020

Background and Philosophy

STRENGTHENING STUDENT EDUCATIONAL OUTCOMES

The Strengthening Student Educational Outcomes Act (ESSB 5946) passed the state Legislature in 2013. It required OSPI to convene a mathematics panel of experts to develop a menu of best practices and strategies to provide additional support to students who have not yet met grade-level standard and are enrolled in LAP to accelerate their mathematics performance.

The mathematics menu includes best practices for students who have not yet met standard as well as connections to best practices for all students as aligned with the Washington State Learning Standards for Mathematics (Common Core State Standards) and the National Council of Teachers of Mathematics. Many of these practices are considered best practice for core instruction as well. Specific population considerations for students are included within each of the best practice and strategies sections.

Photo by Dick Milligan, WA Senate

Under the law, districts must select a practice or strategy from the menu to serve LAP-served students in mathematics. Districts must first focus their LAP program on K–4 reading. Additionally, schools with more than 40 percent of students not meeting 3rd grade ELA goals must select a best practice or strategy to serve K–4 students. Districts have the option to select a practice or strategy from the mathematics menu or they may use an alternative practice or strategy per OSPI guidelines.

Washington state law contains guidelines for how school districts can provide services using the practices and strategies in the mathematics menu to support students in LAP. In addition to the mathematics menu, OSPI developed menus of best practices and strategies in English language arts (ELA) and behavior. All three menus are updated annually by July 1.

To learn more about this process, please see the project web page.

LEARNING ASSISTANCE PROGRAM

The Learning Assistance Program (LAP) offers supplemental services for K–12 students scoring below grade-level standard in English language arts (ELA) and mathematics. These supports focus on accelerating student growth so that students make progress towards grade level performance standards during the period of time they are provided services. These supports may include academic readiness skill development or behavior supports to address barriers preventing students from accessing core instruction. The intent is for LAP-served students to increase academic growth during the period of time they are provided services. Districts are required to use best practices when designing LAP programs to increase student achievement.

LAP K–4 Focus on Literacy

Districts must focus first on K–4 students who have not yet met grade-level standards in reading or are lacking the readiness skills needed for learning to read. The K–4 focus first on literacy does not mean that all LAP funds are to be used exclusively on K–4 literacy. OSPI guidelines allow that a district may meet the K–4 focus on literacy by ensuring that of the total number of K–4 students served by LAP districtwide, approximately 50 percent are students receiving ELA services. Districts are not capped at 50 percent. They may serve more students in K–4 ELA. Additionally, districts may serve less than 50 percent under specific OSPI Guidelines.

LAP Eligibility

Districts identify the students eligible for LAP by using multiple measures of performance. These should include nationally normed assessments and/or state assessments to identify students scoring below grade-level standards for ELA or mathematics. Other options to measure student eligibility include: teacher-made assessments, teacher observations, teacher recommendations, and parent referrals. Credits earned, grade point average (GPA), discipline referrals, and absenteeism are also potential measures.

Entrance and exit assessment data for any LAP service are used to measure student academic growth in ELA or mathematics, regardless of whether the student receives LAP academic services or LAP behavior services. A student may receive LAP services for academic and behavior support or just behavior support.

Behavior Services

Districts may serve students who have not yet met grade-level standards in ELA or mathematics with behavior services. These services are available for students when the district believes addressing behavioral needs would improve students' academic performance.

Prior to receiving LAP behavior services, students must have been identified, using multiple measures of performance, as scoring below standard for their grade level in either ELA or mathematics. While additional indicators must be used to identify a student for behavior services, the impact of behavior services is measured by academic growth. The assumption is that the provision of behavior services should positively influence student academic outcomes.

LAP-Allowable Activities

Allowable LAP activities are guided by state statue (RCW 28A.165). They must be aligned to a best practice from the menu or an approved district alternative. Districts must use data to inform program development and integrate best practices and strategies to support supplemental instruction/services that accelerate growth for students who have not yet met academic and non-academic performance standards.

Allowable activities may include extended learning time, extra support in the classroom, educator professional learning, family engagement, and purchase of specialized learning materials. Additional assistance for students identified in 8th grade to successfully transition into high school may be provided through LAP. Graduation assistance is an option for 11th- and 12th- grade students who are not on track to meet graduation requirements. Academic readiness and Readiness to Learn (RTL) are also LAP-allowable activities. These terms are often confused and are defined below.

Readiness to Learn (RTL) — Up to Five Percent

Up to five percent of a district's LAP base funds may be used for RTL.

District RTL programs provide academic and non-academic supports for students at risk of not being successful in school. They may be offered by the district (in-house), or in partnership with community-based organizations. The goal of RTL community supports is to reduce barriers to learning, strengthen engagement, and ensure all students are able to attend school ready to learn. The school board must approve any community-based organization or local agency in an open meeting before LAP funds may be expended. However, if no external organization is involved and the district is operating their own RTL program, school board approval is not needed.

Students do not need to have been identified as scoring below grade level standard in mathematics or ELA to participate in RTL programs. RTL programs are designed to serve students significantly at risk of not being successful in school. Each district determines the eligibility criteria for participation in RTL programs.

Academic Readiness

As part of the academic readiness component, schools use LAP funds to support students with necessary preparation skills needed to engage in mathematics or ELA content. Readiness is applicable for all grades. However, LAP does pay particular attention to early grade classroom readiness skills. K–2 readiness includes emerging literacy, early numeracy, and classroom preparedness skills. Emerging research is showing that building early numeracy skills is a strong predictor of future academic success.

The Teaching Strategies GOLD® Objectives and Dimensions observation tool identifies core skills in the social-emotional, physical, language, cognitive, literacy, and mathematics domains essential for being ready for kindergarten. The panels strongly emphasized social emotional, cognitive, numeracy, and language skills as being necessary for K–2 readiness. Each panel also recognized the importance of incorporating play into K–2 readiness activities.

WASHINGTON STATE INSTITUTE FOR PUBLIC POLICY (WSIPP)

The 2013 Legislature directed WSIPP to "prepare an inventory of evidence-based and research-based effective practices, activities and programs for use by school districts in the Learning Assistance Program" (Senate Bill 5034, Section 610). The WSIPP Inventory of Evidence- and Research-Based Practices: Washington's K–12 Learning Assistance Program classifies LAP strategies as *evidence-based*, *research-based*, or *promising* based on the average effects of identified interventions, a cost-benefit analysis, and other criteria. Both OSPI and WSIPP consider the two reports as companions. As such, OSPI and WSIPP coordinated their tasks to ensure that the content of both reports were consistent, while still adhering to the unique directives given to each agency.

Both agencies collaborated on identifying topics for consideration for best practices and strategies. Each year, WSIPP Research Associates have contributed as key participants in the expert panel sessions as non-voting members. They provided research references to the panel members and solicited panel member input regarding effective practices. The two agencies then followed different, complementary processes to identify and classify practices for inclusion in each menu.

The identification of best practices and strategies in the OSPI menus was informed by WSIPP's findings, and ultimately determined by the expert panel. OSPI included notations indicating whether the practices included in the menus are *evidence-based* or *research-based*, as determined by WSIPP. Additional practices and strategies are included in the menus as *promising,* based on the research reviewed by the panel of experts.

INTEGRATED STUDENT SUPPORTS

Integrated Student Supports (ISS) promote students' academic success through a school-based approach. An ISS approach involves "developing or securing and coordinating supports that target academic and non-academic barriers to achievement" (Moore & Emig, 2014, p. 1). Current and emerging evidence suggests ISS has positive effects on student engagement, academic achievement, and social-emotional outcomes (Moore et al., 2017). In addition, ISS models like Building Assets, Reducing Risks (BARR) are associated with educators' increased feelings of self-efficacy and willingness to collaborate (Borman, Bos, O'Brien, Park, & Liu, 2017).

According to Child Trend's Theory of Change, an ISS system enables educators to mobilize both academic (i.e. reading or math interventions) and non-academic (e.g. mental health, medical care, behavior intervention plans, or basic needs support) supports to promote students' academic success and overall health and well-being. Research in the interdisciplinary field of developmental science highlights risks to child development and learning, and offers insight into the protective factors most likely to mitigate those risks. Researchers at Boston College's Center for Optimized Student Support have synthesized these findings into Principles of Effective Practice for Integrated Student Support to guide implementation of effective systems of student support. There are several different models of ISS, but *integration* is the defining feature. In practice, integration involves aligning various supports to match students' needs and embedding the ISS program into all aspects of the operations of a school (Moore & Emig, 2014).

Integrated Student Supports in Washington State

In 2016, the Washington state legislature created the Washington Integrated Student Supports Protocol (WISSP) through 4SHB 1541. The bill outlined a set of interdependent strategies for closing educational opportunity gaps, and was based on the recommendations of the State's Educational Opportunity Gap Oversight and Accountability Committee (EOGOAC). The bill charged the Center for the Improvement of Student Learning (CISL), within OSPI, with developing the WISSP and making recommendations to the Legislature to support implementation in districts across the state.

Core Components of the WISSP

The following components of the ISS framework adopted by the Legislature in 4SHB 1541 are included in the WISSP.

Needs Assessments: Professional staff (teachers, school counselors, social workers, etc.) assess students' needs and strengths to identify the areas in which they may need additional support. Additionally, staff conduct system level needs assessments at the school, district, and community level to identify existing resources and potential areas to build capacity.

Integration within the school: Existing school leadership and student support teams help to facilitate ISS in partnership with a lead coordinator. This level of integration requires the buy-in, support and engagement of school leaders. When a partner organization facilitates ISS implementation, the organization works closely with school leadership and staff to ensure effectiveness. To facilitate this level of integration, partner staff are based in the school or, at minimum, have office space within the district.

Coordination of Supports: School staff and partner organizations work together to connect students to existing supports in a timely manner. A central point of contact coordinates these efforts.

Use of Data: School staff use data to identify students' needs and strengths, to monitor their progress over time, and to guide future planning. Data may include academic assessment outcomes, discipline referrals, attendance records, home-language survey information, or other student level data.

Community Partnerships: Schools partner with individual community members, local businesses, health and social service providers, and other community organizations to address the needs of students and their families.

The Washington Integrated Student Supports Protocol is not meant to replace existing systems of support such as Response to Intervention (RTI), School-wide Positive Behavioral Interventions and Supports (PBIS), Inter-connected Systems Framework (ISF), or other tiered-systems of support that address one or more domains of learning. Rather, the purpose of the protocol is to encourage schools to use needs assessments to identify students' academic and non-academic barriers to learning, collaborate with their community to secure additional resources for students and their families, use data to monitor progress, and strive for greater alignment across student support services and programs like LAP.

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MULTI-TIERED SYSTEM OF SUPPORTS

Multi-Tiered System of Supports

Multi-Tiered System of Supports (MTSS) is a service delivery framework focused on problem solving and prevention for all students. MTSS is a holistic approach that connects all of the academic and non-academic interventions, supports, and services available in schools and communities to support instruction and eliminate barriers to learning and teaching. Multiple levels of instruction, assessment, and intervention are designed to support the academic and non-academic needs of ALL students within the MTSS framework. Common tiered frameworks in Washington include Response to Intervention (RTI), Positive Behavioral Interventions and Supports (PBIS), and Social and Emotional Learning (SEL).

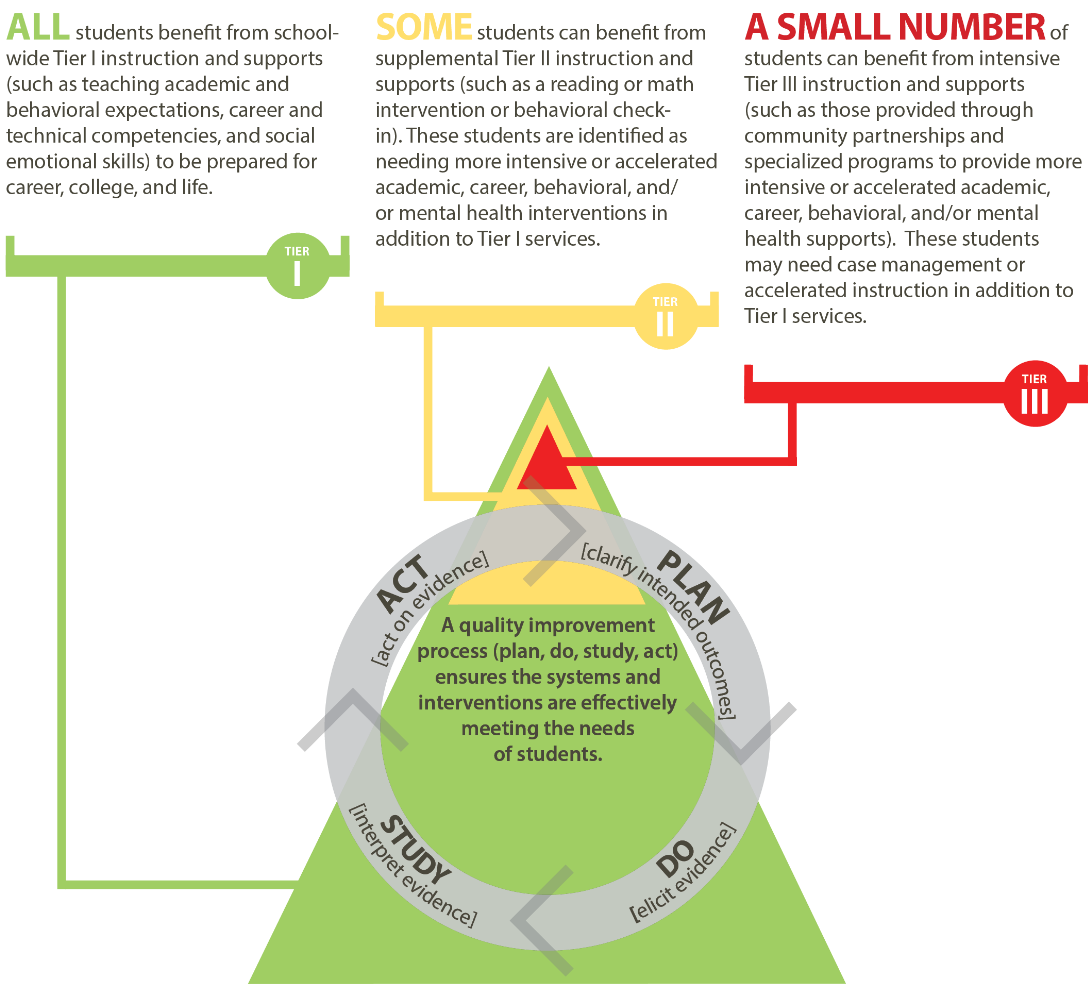

Figure 1. Multi-Tiered System of Supports, from OSPI.

Core Instruction

A positive school climate and high-quality core instruction are the foundation of successful MTSS implementation. Within a multi-tiered system of supports, educators use data-informed practices to support student outcomes. If more than 20 percent of students are not meeting grade-level expectations, a focus on improving core instruction is essential. To support students with a range of skills, abilities, knowledge, and interests, Meyer, Rose & Gordon (2014) suggest a Universal Design for Learning (UDL) approach. It is critical for educators to produce content, instruction, and assessments in a way that addresses the uniqueness of every student, and UDL provides a framework to do just that. By designing a flexible curriculum responsive to exceptional learners, teachers provide learning opportunities that are more accessible for all.

The UDL Guidelines are based on the idea that students are accessing three cognitive networks as they learn: *affective*—the "why" of learning; *recognition*—the "what" of learning; and *strategic*—the "how" of learning. The UDL Guidelines provide a matrix that unpacks the why, what and how into three levels of learning: accessing, building and internalizing. Concrete suggestions for incorporating each network into teaching provide educators with a way to rethink and transform the learning opportunities they offer their students. There are a number of websites with information about UDL and materials for coaches and teachers, including: the State Education Resource Center (SERC) tutorial on Culturally Responsive UDL, CAST, The IRIS Center, and the National Center on Universal Design for Learning. Additional UDL resources are available on OSPI's Educational Technology Program page.

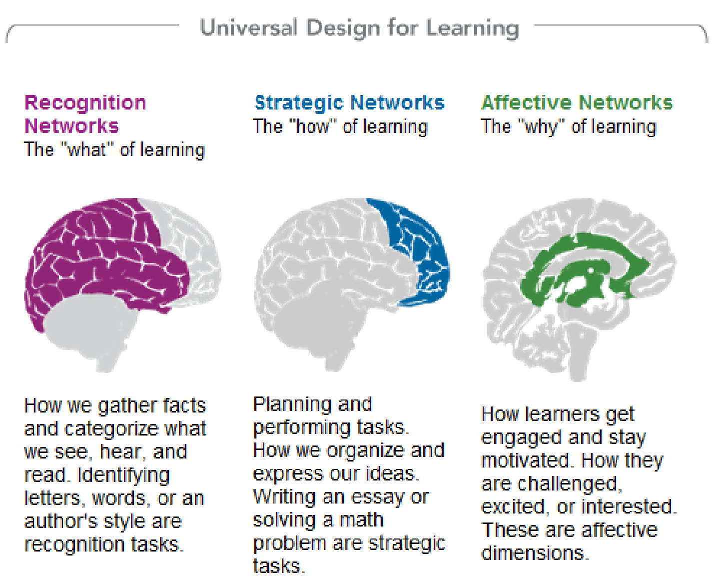

Figure 3. Retrieved from www.udlcenter.org. © CAST, 2011. Used with permission.

Tiered Supports

Within a multi-tiered framework, the tiers refer to supports students receive rather than students. For example, there are not tier 2 or tier 3 students. There are instead, tier 2 and tier 3 supports. In a three-tiered framework, **all** students receive tier 1 instruction, **some** students receive tier 2 services/support, and a **small number** of students receive tier 3 services/support. Normally, tier 3 academic services in an MTSS model are for both highly capable students and students who have not yet met grade-level expectations.

When students are not meeting their learning goals in the general education classroom, school improvement teams meet to discuss the best approach to provide effective differentiated instruction in the core curricula and interventions through a systematic support framework. Learning Assistance Program (LAP) allowable activities primarily provide students tier 2 and tier 3 supports. For the purpose of LAP, tier 3 refers to services intended to address the needs of students who have not yet met academic learning goals.

Number of students	Description of tier
All	Tier 1 is for all students and is designed to meet the needs of at least 80 percent of the student population. Differentiated instruction during core learning time is the first response for students who have not yet met academic and non-academic goals.
Some	Tier 2 is for students who need additional support to meet academic and non-academic goals. A standard assessment plan and clear criteria are necessary for successfully entering and exiting students from tier 2 interventions. Supports should be designed to quickly screen for and target students who need extra instruction or services to get back on track. This level of support is available to all students and typically addresses the needs of around 15 percent of a student population.
A small number	Tier 3 is for interventions that are individualized and intensive. Tier 3 interventions may take longer for students to meet learning goals. When tier 1 and tier 2 are implemented well, tier 3 typically addresses the needs of about five percent of a student population. Tier 3 supports are available for ALL students, as opposed to the common misunderstanding that they are reserved for students in special education.

System of Assessment

An important element of the MTSS framework, assessment creates data so that teams can make informed decisions. A well-designed assessment system must be both balanced and comprehensive and, most importantly, provide actionable information.

A *balanced* assessment system means that districts/schools engage in a variety of assessments, identifying specific assessments for different learning needs. While various types of assessments are useful for different purposes, districts should also analyze whether or not some types of assessments are used more frequently or receive more emphasis over the other types. Districts/schools should make adjustments if the system is out of balance. It is critical to ensure the results of an assessment are used for the intended purpose and not extrapolated or misused otherwise. For example, confusion between universal screening and diagnostic assessment can lead to misuse of results from screening measures. It is also important to note that different types of assessment can be used for more than one purpose and, generally, no one piece of assessment information can fulfill all purposes.

A *comprehensive* assessment system includes tools and processes that are specifically designed to address various stages of learning. Assessment tools include: universal screening, diagnostic data collection, formative assessment processes, progress monitoring, benchmark tests, and summative assessments. Assessments can be used to identify learning needs, investigate learning challenges, inform current learning, monitor learning progress, and verify learning.

A *comprehensive* assessment system should include:

Universal screening tools: These tools are used to identify all students who may potentially need more support. By design, universal screeners tend to over identify students, meaning more students are identified *as potentially needing additional support* than are *actually needing additional support* in an attempt to not miss anyone who might benefit from additional layers of support. Screeners are used in many different ways—in everyday life, before an eye exam, during oil changes for cars, or when checking blood pressure. Universal screening takes place at scheduled intervals (e.g., at the beginning of the school year, every 8 weeks) and is followed by more targeted diagnostic assessment for students identified as potentially needing additional support. These screeners inform decision makers of whether or not diagnostic data collection is necessary. Screeners also serve the purpose of assessing how well all students are responding to core instruction and if modifications or adjustments are needed to the school-wide tier 1 plan.

Diagnostic data collection: Collecting diagnostic data can help identify the initial skill level for each student and can determine the need for supports, interventions, enrichments, and resources. Diagnostic data are collected before instruction or after screening occurs to identify the appropriate instruction and/or intervention plan. Diagnostic data provides detailed information. Diagnostic data can help determine why a person's temperature is high, why the indicator light went on in a car, or whether a full eye exam is needed. For example, in mathematics, a diagnostic test may measure a student's ability to count, understand cardinality, compare and order numbers, perform operations, think algebraically, and comprehend word problems. Once the diagnostic data are available, educators can determine what to teach and select appropriate interventions to address specific skill deficiencies.

Formative assessment processes: Formative assessment is not a single event—it is an ongoing process used by educators and students to assess learning and adjust instruction. The formative assessment process is deliberate and provides actionable feedback to improve students' learning. There are four main attributes in the formative assessment process:

1) clarify intended learning

2) elicit evidence

3) interpret evidence

4) act on evidence

As teachers embed the formative assessment process into their classes, student involvement is key. Students should understand the learning target and how what they are doing relates to their own learning. They should be able to self-reflect on their progress and set attainable and specific goals. Similarly, teachers evaluate what has been learned and adjust instruction accordingly.

Progress monitoring tools: Student performance and progress should be reviewed on a regular basis and in a systemic manner to identify students who are making adequate progress, at some risk of failure if not provided extra assistance, or at high risk of failure if not provided specialized supports. Progress monitoring is used to determine if students are responding to the instruction being provided. It is useful in determining the next level of instruction or intervention to be used with individual students, a small group, or an entire class. While formative assessment is closely linked to the immediate learning that occurs during a lesson, progress monitoring assesses what the student understands as a result of the unit of instruction. Progress monitoring occurs on a more frequent basis for students receiving tier 2 and tier 3 supports.

Summative assessments: Summative assessments are outcome-based assessments of learning that has already occurred. The goal of standardized summative assessment is to confirm and verify student learning and skill acquisition. Summative assessments are typically given once after an instructional unit, course, semester, program or school year to measure student attainment of desired learning outcomes, i.e., how students did on grade-level learning standards. Examples of summative assessments may include benchmark tests, final projects, midterm exams, or state assessments. Summative assessment data can be used to inform system-wide instructional decisions. Summative assessments are limited in providing adequate data to drive individual-student instructional decisions because they measure one point of learning at the end of a unit, course, semester, program or school year. For the individual student, summative data results should be used in combination with other measures to inform instruction.

Benchmark assessments: A type of summative assessment, benchmark assessments are outcome-based and usually measure skills and knowledge demonstrated by a specific period of time (e.g. end of unit test). At the elementary level, students are typically assessed on their progress toward skills that should build throughout the year. These assessments are administered at predetermined time points (e.g., October, January, March and June). Students' skills are viewed relative to a goal, or "benchmark," which indicates the desired progress toward end-of-year standards for that time point. The data from benchmark tests should generally be used to inform instructional steps to improve student learning. This is different from formative assessment because benchmark assessments capture a snapshot of student learning rather than functioning as an on-going formative process. Benchmark assessments may also be used to evaluate programs, curriculum, and intervention strategies.

Some assessments can function with dual purpose. It's important to have a clear purpose and desired outcome when deciding which assessments to use.

TYPE	PURPOSE	Data Outcomes	Guidance
Universal Screening Tools	To IDENTIFY students who need extra support(s) – *usually for all students, but can be a targeted group*	-Identify or flag students who are struggling or at risk of failure who need further monitoring -Identify students who might have specific learning challenges (i.e. Dyslexia, language proficiency) -Evaluate effectiveness of academic curriculum	-Data can be collected one or more times a year -When there is a summative test that provides individual student data, screeners are best applied to a specific group of students who might benefit from extra support(s)
Diagnostic Data Collection	To INVESTIGATE the specific needs for students identified as needing extra support(s) – *for some students*	-Inform educators about possible causes of student challenges -Identify appropriate focus for interventions -Explore and identify possible instructional and/or intervention approaches -Guide analysis of data points to use for progress monitoring	-The goal is to help educators plan effective and individualized instruction and/or interventions -Students can often provide meaningful insight about their learning strengths and needs; their self-assessments should be considered
Formative Assessment Process	To INFORM current instruction so teachers can adjust – *for all students, ongoing*	-Reveals depth of understanding and partial or developing understandings -Provides feedback to educators about which strategies have been successful	-Student engagement is a key element -Formative assessment processes can vary greatly, from in-the-moment learning checks to classroom tasks – not all of these will be traditional "data" collection but will still guide and inform instruction
Progress Monitoring Tools	To MONITOR the progress of specific students who have been identified as needing extra support(s) – *for some students*	-Provides information about a specific group of students -Provides information about progress toward previously identified learning targets during a specific period -Helps educators adjust instruction and/or interventions	-Student engagement is a key element -Educators can use this combined with formative assessment processes for the whole group to more closely monitor a specific student group -The method and amount of data should vary

TYPE	PURPOSE	Data Outcomes	Guidance
Summative Assessments	To VERIFY learning has occurred – *for all students*	-Standardized test results to measure specific outcomes (such as grade-level standards) -To confirm what students know and are able to do at a specific time (end of year, end of unit) -Includes benchmark tests	-Because data provides information about individual students and groups, it can be used to make systematic decisions about instruction, curriculum and programs -Because the data only measures one single point in time, it should be used with other measures to gather a complete picture of student learning
Benchmark Assessments	To VERIFY learning has occurred by a specific time – *usually for all students*	-Standardized measure of specific outcomes at a specific point in time -To check what students know and are able to do at a specific point in time	-Can be used to inform and adjust instruction as these are usually at regular intervals through the school year -Districts will often use this to check systems and monitor student progress -Should align to year-long goals and school curriculum --Students should be part of this process (self-reflection)

Data-Based Decision-Making Teams

Decision-making within an MTSS framework is done with a systematic and comprehensive approach. This process includes decisions about the development of the MTSS framework, the selection of assessments used to identify students, the design of an implementation plan, and evaluation of a school or district's individual students' needs. Schools should thoughtfully create a plan that respects the school's unique culture, resources, and circumstances within a collaborative systemic approach.

Schools and districts will need to establish and monitor systematic structures, including a comprehensive and balanced assessment system. As teams engage in ongoing collaboration in data collection and analysis to address student needs, they should also develop a feedback process to evaluate the effectiveness of their MTSS framework and implementation.

Data collected can be used to inform instruction or to make decisions about tiered supports. Examining trends of data can help evaluate programs and guide decisions regarding instructional effectiveness, student responsiveness, and intervention adaptations or modifications.

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Implementation

BACKGROUND, RESEARCH, AND IMPLEMENTATION FIDELITY

The math menu was created to guide schools and districts as they develop supports and services for students who have not yet met standard in mathematics. It is critical to ensure best practices are used to design intensive intervention plans for students. These plans need to be implemented with fidelity because even proven practices, when poorly implemented, can fail to raise student educational outcomes.

Often, the word *fidelity* is viewed negatively; however, the LAP team encourages approaching fidelity in a similar manner as integrity or commitment. Implementation fidelity is about delivering an intervention as it was intended to be delivered according to the implementation team's plan.

The panel of experts recognizes there are a number of steps that must be taken to ensure the practices within the menus are implemented with fidelity across the state. Using implementation science is optional. This information is provided as a resource for buildings and districts.

Active Versus Passive Implementation

New practices are implemented at the district/building level each year. Some are implemented with success, while others are not. All too often, promising innovations and practices are abandoned after just a year or two because the expected results were not actualized and the best practice was viewed as ineffective. But, was the *practice* ineffective or was *implementation* ineffective?

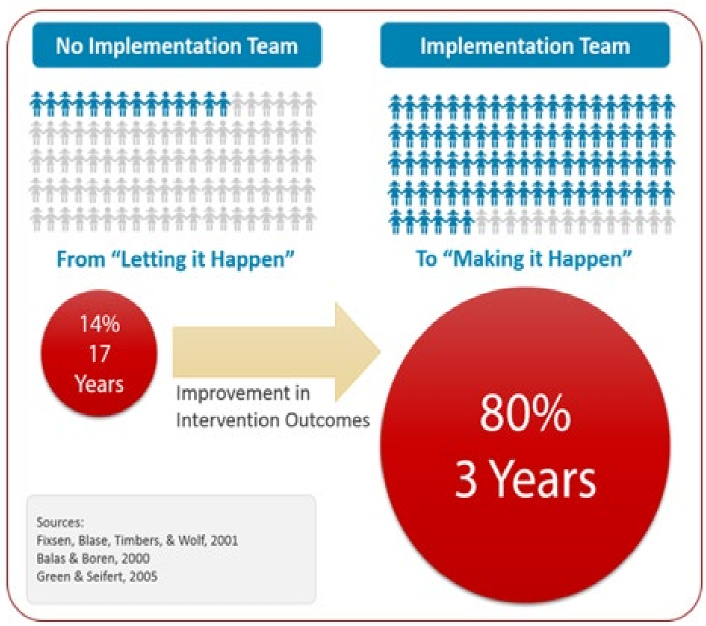

Figure 3. Used with Permission National Implementation Research Network.

As schools/districts select practices from the menu, the implementation plan—and the degree to which the plan is delivered—is key to successfully achieving the desired student outcomes. Active implementation is the direct result of action driven teams, purposeful planning, and systematic improvement cycles.

Figure 3 displays both passive and active implementation. When passive implementation occurs, it takes approximately 17 years to accomplish trivial results (14 percent). Whereas with active implementation, teams can move toward full implementation (with 80 percent effectiveness) in three years.

Implementation Science

Implementation science provides a framework to support the implementation of best practices in education. Implementation science values local conditions and context-specific issues with the assumption that one size will not fit all. Full implementation of best practices takes purposeful planning and time. Implementation science includes a systematic process to ensure full implementation is actualized. The frameworks include the what, how, and who to assist implementation teams with the process. The most effective implementation teams consist of decision makers and practitioners across the system to develop and review systematic improvement cycles.

The National Implementation Research Network (NIRN) focuses on active implementation. The Active Implementation Hub (AI Hub) is a free resource available to schools/districts who want to deepen their understanding of implementation science and the power of active implementation. Modules on the AI Hub provide an overview of active implementation and include implementation drivers, teams, stages, improvement cycles, usable interventions, and fidelity checklists.

Plan, Do, Study, Act

The *Plan, Do, Study, Act* approach in implementation and improvement science, and the *Plan, Do, Check, Act* approach in Lean organizations, are iterative improvement cycles that support active implementation. Iterative cycles are repetitive and use a trial and learning approach. In each cycle, implementation teams plan, provide the intervention, review the results, and identify areas for improvement. These teams review student outcomes and adult behaviors, specifically identifying if the intervention was delivered as intended by the plan; then, teams identify specific actions to improve the plan.

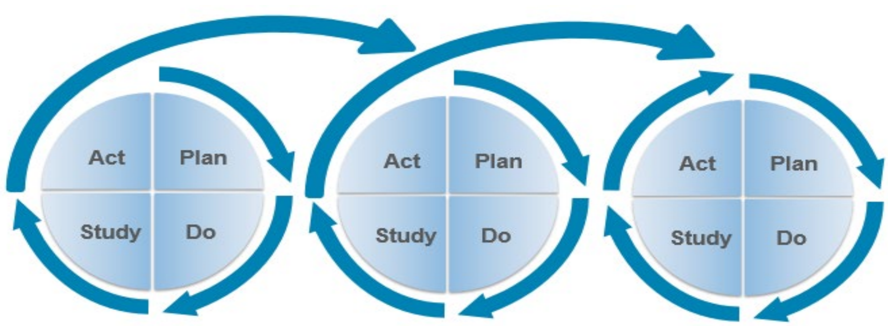

Figure 4. Image used with permission from the National Implementation Research Network.

With each improvement cycle, implementation teams learn what went well and what needs to be adjusted to deliver the intervention more effectively in order to benefit student outcomes. Over the course of three active improvement cycles, the effectiveness of an intervention generally reaches 80 percent effectiveness.

Each phase of the *Plan, Do, Study, Act* cycle guides implementation teams:

- **Plan-**Implementation teams identify purpose, desired outcomes, and success criteria for implementation. Teams identify data and progress monitoring tools that will be used to measure the success of the intervention, who is responsible for collecting data, and when data will be collected and reviewed. Teams will identify challenges that may impact implementation (e.g., transportation, staffing, etc.) and specify how to move interventions forward.
- **Do-**Implementation teams execute the intended intervention plan. Educators complete intended outcomes according to the plan and collect data to ensure the intervention support was delivered.
- **Study-**Implementation teams reflect on the execution of the intended intervention plan. Teams review success criteria and outcomes. Reflective discussions include: what went well, what can be improved, and what unexpected barriers or surprises occurred.
- **Act-**Implementation teams apply learning to identify action steps to improve the process. Teams make targeted adjustments to the original plan to impact student outcomes. Implementation teams use these action steps to begin planning for the next cycle.

Improvement cycles vary in length. The improvement cycle may span across a single school year or for a specific amount of time (such as a quarter, trimester, or semester). Rapid improvement cycles generally range from 30–90 days. Implementation teams should discuss and determine which cycle is best to use with the intervention they are implementing.

The LAP team and panel of experts understand that using implementation science is optional.

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DISTRICT AND BUILDING RESOURCES FOR IMPLEMENTATION

AI Hub is a web-based resource that has been developed and maintained by the State Implementation and Scaling-up of Evidence-based Practices Center (SISEP) and NIRN at The University of North Carolina at Chapel Hill's Frank Porter Graham Child Development Institute. *Implementation Science Modules and Lessons* are available to assist implementation teams. The modules provide self-paced content, activities, and assessments that are designed to promote the knowledge and practice of implementation science and *scaling-up,* improving and expanding the impact of, best practices.

One tool within the AI Hub is the Hexagon Tool. The Hexagon Tool can help states, districts, and schools appropriately select evidence-based instructional, behavioral, and social-emotional interventions and prevention approaches by reviewing six broad factors in relation to the program or practice under consideration. NIRN developed the Hexagon Discussion and Analysis Tool for Implementation Teams to guide deeper discussions and address unique needs.

IMPLEMENTING SITE INDICATORS

CAPACITY TO IMPLEMENT

Staff meet minimum qualifications

- Able to sustain staffing, coaching, training, data systems, performance assessment, and administration
- Financially
- Structurally
- Cultural responsivity capacity

Buy-in process operationalized

- Practitioners
- Families

FIT WITH CURRENT INTIATIVES

Alignment with community, regional, state priorities

Fit with family and community values, culture and history

Impact on other interventions & initiatives

Alignment with organizational structure

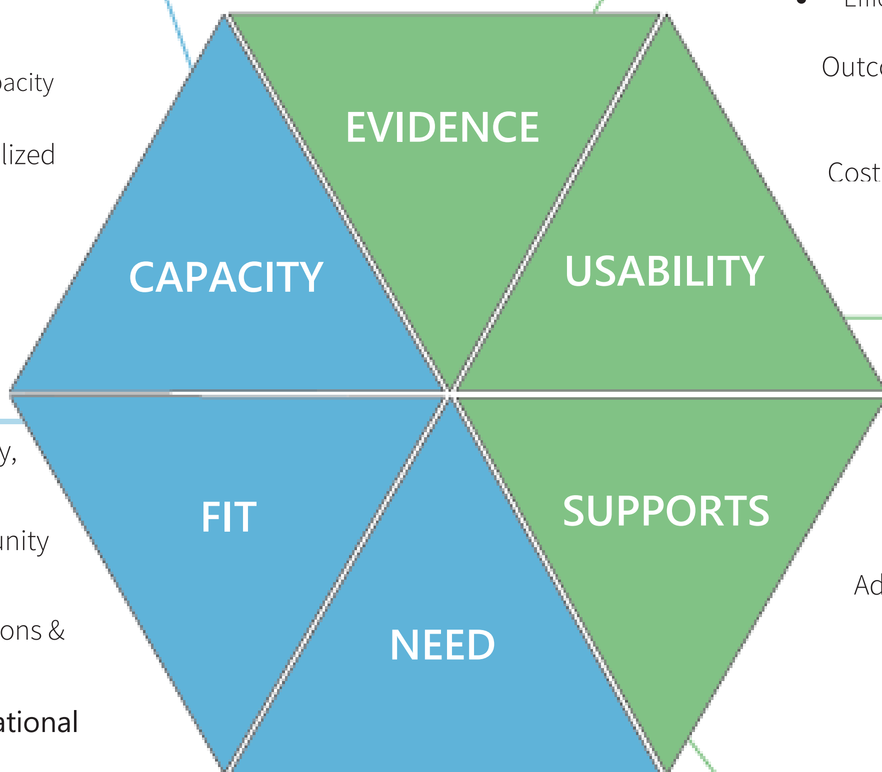
NEED

Target population identified

Disaggregated data indicating population needs

Parent & community perceptions of need

Addresses service or system gaps



PROGRAM INDICATORS

EVIDENCE

Strength of evidence—for whom in what conditions:

- Number of studies
- Population similarities
- Diverse cultural groups
- Efficacy or Effectiveness

Outcomes – Is it worth it?

Fidelity data

Cost – effectiveness data

USABILITY

Well-defined program

Mature sites to observe

Several replications

Adaptations for context

SUPPORTS

Expert Assistance

Staffing

Training

Coaching & Supervision

Racial equity impact assessment

Data Systems Technology Supports (IT)

Administration & System

NIRN provides a glossary of terms for educators who are new to implementation science.

The Carnegie Foundation for the Advancement of Teaching is grounded in improvement science and has several resources to accelerate learning and address problems of practice. Improvement science is a systematic learning-by-doing approach. The Carnegie Foundation highlights using *Plan, Do, Study, Act* for implementation and provides a variety of resources for facilitating improvements in education, including teacher effectiveness. Resources recommended by the panel of experts for optional use are the 90–day Cycle Handbook and the Six Core Principles of Improvement.

Figure 6. Image used with permission from the Carnegie Foundation.

The Six Core Principles of Improvement
Carnegie Foundation for the Advancement of Teaching

Principles	Descriptions
1. Make the work problem-specific and user-centered.	Starting question: "What specifically is the problem we are trying to solve?"
2. Variation in performance is the core problem to address.	Focus on what works, for whom, and under what set of conditions.
3. See the system that produces the current outcomes.	Explore and think about how local conditions shape work processes. Share your hypotheses for change with others to help clarify your goal.
4. We cannot improve at scale what we cannot measure.	Include measures of key outcomes and processes to track if the implemented change is an improvement.
5. Anchor practice improvement in disciplined inquiry.	Try to use rapid cycles of Plan, Do, Study, Act (PDSA) to learn and improve quickly.
6. Accelerate improvements through networked communities.	Find other partners and share what you learn in order to be more productive.

The Carnegie Foundation provides a glossary of improvement science terms and network improvement communities.

Content Philosophy (WA State Mathematics)

Vision of Mathematics Education

The Mathematics K–12 Learning Standards are built on an intentional progression of the skills and knowledge necessary for all students to be ready for career, college, and life when they exit high school. The progressions of learning provide a coherent focus based on the mathematics standards for each grade level. Understanding this progression of knowledge and skills supports identifying gaps in a student's learning that should be addressed.

Building on the work of the National Council of Teachers of Mathematics (NCTM), this vision of mathematics education requires students to reason and model with mathematics, be problem solvers, and analyze and interpret data. Mathematic programs that emphasize only computation and memorization should be updated or replaced with curriculum designed to develop these areas of mathematical thinking.

Today, students not only need to be fluent and flexible with numbers and operations, they need the capacity to apply concepts and skills to novel situations, to approach real-world problems with stamina, and to understand that there may be multiple viable solution paths and solutions depending on the context of the problem and the assumptions of the problem-solver.

A key component of the Mathematics K–12 Learning Standards are the Standards for Mathematical Practice. These standards reflect this vision of mathematics education and describe the mathematical habits that mathematics educators at all levels should seek to develop in their students. The Standards for Mathematical Practice are:

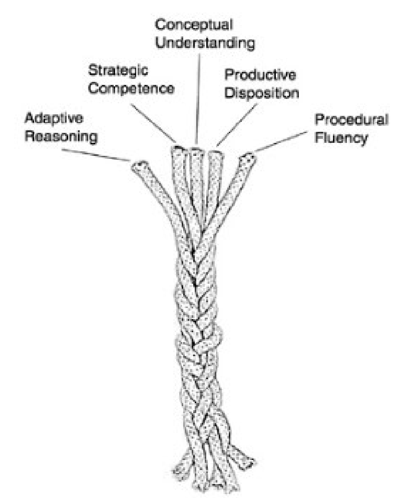
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mathematics instruction, then, should use the mathematical practices to engage students in the mathematics content and develop students as "practitioners of the discipline of mathematics." For more information, see the Standards for Mathematical Practice. Additionally, we must develop a growth mindset focusing on the belief that all students can be mathematical thinkers. In fact, The National Research Council (2002) asserts that:

> Many adults assume that differences in mathematics performance reflect differences in innate ability, rather than differences in individual effort or opportunities to learn. These expectations profoundly underestimate what children can do. The basic principles, concepts, and skills of mathematics are within reach of all children. When parents and teachers alike believe that hard work pays off, and when mathematics is taught and learned by using all the strands of proficiency, mathematics performance improves for all students. Careful research has demonstrated that mathematical proficiency is an obtainable goal.

The National Research Council (2002) describes five interdependent strands of mathematical proficiency:

- **conceptual understanding** – comprehension of math concepts, operations, and relationships
- **procedural fluency** – skill in carrying out procedures flexibly and accurately
- **strategic competence** – ability to formulate, represent, and solve problems
- **adaptive reasoning** – capacity for logical thought, explanation, and justification
- **productive disposition** – inclination to see mathematics as worthwhile and view oneself as mathematically capable



Reprinted with permission from Adding It Up: Helping Children Learn Mathematics, (2001) by the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C.

The learning environment should nurture co-development of these strands for learners, including attention to mathematical attitudes of students, their families, and the communities in which they live.

Focus, Coherence, and Rigor

The Mathematics K–12 Learning Standards call for shifts in the way we approach mathematics education. The shifts are:

- Focus: Provide greater focus on fewer topics that are foundational to future mathematical success.

- Coherence: Build a progression of learning from grade to grade and intentional connections between content within a grade.
- Rigor: Pursue conceptual understanding, procedural skills and fluency, and application with equal intensity.

Focus means deep engagement within the major work of each grade. Rather than racing to cover many topics at surface level, the learning standards ask mathematics teachers to deepen the way time and energy are spent on fewer foundational concepts. *Coherence* requires that content be carefully connected across grades, intentionally building on prior knowledge, and that topics within a grade be connected to make sense of the mathematics and increase its relevancy. *Rigor* refers to deep understanding of mathematics concepts. Students must have the opportunity to access concepts from multiple entry points and perspectives. Students must also be fluent with calculations and procedures so they can access more complex concepts and procedures. Rigor calls for a balance of this conceptual understanding, procedural fluency and application to mathematics in realistic settings.

Finally, students must have the opportunity to apply concepts and procedures to new and novel situations (Common Core State Standards Initiative, 2015). Curriculum should be designed to incorporate rich and meaningful tasks to make mathematics meaningful.

Mathematics Teaching Practices

The teaching principles presented in NCTM's 2014 publication, *Principles to Actions: Ensuring Mathematical Success for All* represent the research-based recommendations for all educators. Teachers, coaches, and specialists in mathematics including any interventionists who will be working to assist children in their mathematics study can implement the following eight strategies. The mathematical teaching practices reflect the range of instructional strategies and approaches necessary to promote deep learning of mathematics.

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.

8. Elicit and use evidence of student thinking.

These practices align with the state standards and prepare students to be college- and career-ready in the 21st century.

High Leverage Teaching Practices

A range of instructional strategies and approaches is necessary to promote deep learning of mathematics. Implementing NCTM's teaching practices, described more fully in the section entitled *Mathematics Teaching Practices* earlier in this document, along with purposeful instructional routines such as those described in the *Mathematically Productive Instructional Routines* section, creates meaningful opportunities for students to develop strong conceptual understanding. Using a combination of approaches, like posing purposeful questions, supporting productive struggle, and eliciting student thinking is critical both in core instruction as well as successful intervention strategies.

Early Numeracy

"'Numeracy' is a term that refers to all the mathematics that young students learn including number, operations, and geometry and measurement concepts" (Learning Pathways in Numeracy, 2014). Research has shown that the mastery of early mathematics concepts (number sense and counting) upon school entry is the strongest predictor of future academic success (Duncan 2007). Young children can have mathematical ideas that are complex and sophisticated for their developmental levels. Learning to make sense of mathematics early helps build future math proficiency and confidence.

Pre-kindergarten children can explore mathematics ideas, including number concepts and quantities, number relationships and operations, geometry and spatial sense, patterns, and measurement and comparison. The important idea to convey is that early numeracy is about developing and making sense of mathematics rather than repetitive pencil and paper activities. For example, asking a child to count the number of cups to distribute at snack time, to notice some of the windows on the playhouse are circles and some are squares, or to discuss how a big step is as tall as two regular steps demonstrates the relevance of mathematics. Making sense of mathematics happens through play, number sense games, and other daily routines.

A critical success factor, and an important tie-in to early literacy, is to get children to communicate their ideas and explain their thinking about mathematics in their natural language. Providing opportunities for children to share their thinking helps educators understand what concepts the child understands and surfaces any gaps in their mathematical understanding. Teachers can then direct students in additional learning, refining their thinking or extending their thinking in mathematical ways.

Representation includes concrete manipulation of objects, pictures, and numerical symbols. Working with physical objects and visuals informs and strengthens abstract thinking. Manipulatives and visual representations of mathematics should be routinely utilized in early learning, along with activities and tasks that are relevant to the child's developmental age and grounded in the Mathematics K–12 Learning Standards.

Early learners develop mathematical skills and encounter math concepts through natural and routine activities and play. Educators and caregivers can support this process by creating time and space for exploration and manipulation. As adults observe and listen to children at play, they can notice math ideas students are utilizing in their play. For example, children playing outdoors might use positional language to describe how they are climbing "up high" or running "under" the slide. Gently nudging a child through use of questions and the introduction of new language can help them build mathematical understanding, though adults should be cautious not to take over or direct a child's play. Observing and talking with students at play can help teachers determine natural interest areas that can become the basis for selecting books and topics for classroom projects to further develop mathematical understandings and skills.

Active involvement of families is a critical success factor for building early numeracy skills. So much of a child's early learning takes place in the home environment. When families incorporate mathematical sense-making in play and other daily activities, children experience more opportunities to learn numeracy, increase their academic vocabulary, and improve their readiness for a K–2 learning environment. OSPI's Early Numeracy Brochure is an excellent resource for parents to support mathematics at home and is available in ten languages.

K–2 Readiness

Each child brings valuable and unique knowledge and experience into the classroom. Variation among students within the same classroom is normal and expected.

The observational assessment tool, Teaching Strategies GOLD®, that is used with WaKIDS supports teachers to gather information about students' progress along a continuum of growth within social-emotional, physical, language, cognitive, literacy, and mathematics domains. Within the mathematics domain, teachers in Washington record data on the following objectives:

1. Uses number concepts and operations
    a. Counts
    b. Quantifies
    c. Connects numerals with their quantities
2. Explores and describes spatial relationships and shapes

Data related to these objectives are gathered through naturalistic observation of children as they engage in classroom activities. Teachers create opportunities for children to demonstrate their knowledge and abilities, including open-ended play and developmentally appropriate tasks or situations, which makes it possible to collect this data.

Learning Pathways in Numeracy describes a progression of learning from birth through 3rd grade in five different mathematical content areas: Counting and Cardinality, Number and Operation in Base Ten/Fractions, Operations and Algebraic Thinking, Measurement and Data, and Geometry. The Learning Pathways is a tool that supports teachers as they monitor and support continual student growth across developmental levels for early mathematics. This document was developed in alignment with Mathematics K–12 Learning Standards, and also aligns with the Washington Early Learning and Development Guidelines and Teaching Strategies GOLD® utilized for WaKIDS. The Learning Pathways in Numeracy allows educators to identify where students are in their progression of learning, and to make instructional decisions to support each child's learning. Child development follows predictable trajectories, with individual children progressing at different rates. Within any classroom, there is likely to be a wide range of skills and abilities but each can be found somewhere along the developmental continuum. This document is a useful tool when working with LAP-served students to identify mathematical strengths and areas for growth.

As part of the K–2 Readiness component of LAP, schools can use LAP funds to ensure students are ready for K–2 learning. Check with your district LAP coordinator for details. Some ideas include:

- During kindergarten registration in the spring, create a few stations where children can demonstrate their mathematical sense making as they play. Observe to identify strengths or areas for growth. Use this time to gather information from families about the child's mathematical interests and experiences.
- Provide a kindergarten readiness event in August before the school year starts, to observe early numeracy skills. This preliminary observation can inform instructional decisions, though it is important to recognize that children may demonstrate more knowledge and skill after they have established relationships with their teachers and feel a connection to school.
- Share engaging and age appropriate math activities for families to support children at home. This could include providing materials or ideas for simple counting games using dot dice to foster subitizing (the ability to identify a small quantity of objects without counting). The ability to subitize forms the building blocks of addition and subtraction.

- Integrate early numeracy within early literacy to support the learning of both content areas. Stories are a wonderful opportunity to ask mathematical questions such as "How many birds are there—let's count them" or "Where do you see circles?"

With each of the strategies above it is important to select activities that convey to children that doing math is meaningful and worthwhile.

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Instruction and Interventions

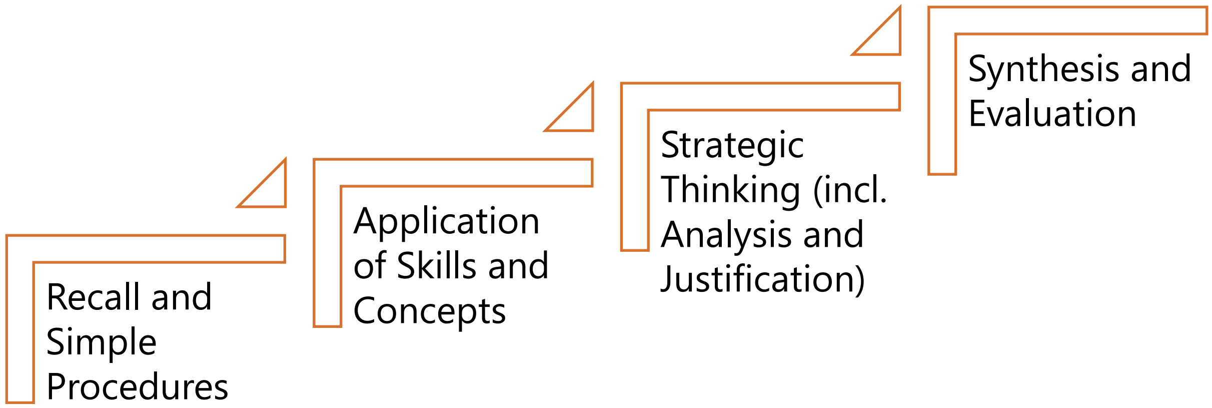
All students should receive high-quality mathematics instruction which is grounded in the use of evidence-based materials and instructional methods implemented with fidelity. However, even with a high-quality, rigorous core program, no single program will meet the needs of all learners. Most students will successfully learn when a high-quality core program and effective instruction are implemented. If more than 20 percent of the students in a school are struggling, the district should re-examine their core curriculum and instructional strategies used within the classroom. The core curriculum should be aligned with the Mathematics K–12 Learning Standards, instructional practices should focus on reasoning rather than computation and memorization, and the classroom should offer instructional supports for their particular student population.

As a strategy for improving the achievement of learners who have not yet met standard, focusing the learning on grade-level foundational mathematics concepts and skills is much more effective than remedial instruction. Too often, remedial instruction is slow-paced and concentrates only on lower-level skills. Focusing the learning on grade-level foundational mathematics concepts and skills closes the gap for students who have not yet met standard by engaging them in concept-based mathematical experiences that focus on reasoning and sense-making. Students who have not yet met standard should have many opportunities to engage in rich tasks that provide multiple entry points, provide opportunities to reason through the mathematics, and tasks that honor how students arrive at a solution. Henry Levin, founder of the Stanford Accelerated Schools Project, has found that remediation actually slows students' progress. Levin's research suggests that remedial intervention models lower learning expectations and marginalize students: once students are assigned to remedial interventions, their learning slows and the opportunity gap, therefore, widens.

Using varied approaches to instruction is necessary in all academic areas; but tracking, where students are assigned to either remedial or high-achieving classrooms, should be viewed with caution. Heterogeneous classrooms help all students, especially when differentiated instruction is well constructed. Pulling students out of their core instruction times for remediation serves only to worsen the opportunity gap between students.

Depth of Knowledge

Students who are targeted for intervention are sometimes put into remedial skills-based programs that lack significant rigor. While fluency is an important goal for intervention, evidence suggests that teaching applicable use of strategies is more effective than rote memorization. Depth of knowledge refers to a framework of rigor that classifies tasks through levels of increasing cognitive demand. Webb's (2002) model has four levels:



Teachers should provide all students access to mathematical tasks at a variety of rigor levels emphasizing the use of the mathematical practices.

Curriculum of Supplemental Services

Curriculum includes both the process and content of instruction. For students receiving supplemental services, it is imperative that the instructional practices provide students the opportunity to engage in the Standards for Mathematical Practice. To support the learning of students who have not yet met grade-level standards, the content of instruction must focus on the major work of that grade-level. Intentional planning and consideration of these key ideas will help build a strong foundation for future success in algebra and mathematics courses beyond algebra. See the Where to Focus document from Achieve the Core for more information on the major work for grades K–8 and the progression to algebra.

Intervention Materials

According to the What Works Clearinghouse Practice Guide for Assisting Students Struggling with Mathematics, intervention materials should be reviewed by experts knowledgeable in mathematics instruction. Materials should meet four criteria:

1. The materials integrate computation with solving problems and visual representations rather than teaching computation apart from problem-solving.
2. The materials stress the reasoning underlying calculation methods and focus student attention on making sense of the mathematics.
3. The materials ensure that students build algorithmic proficiency.
4. The materials include frequent review for both consolidating and understanding the links of the mathematical principles.

A systematic curriculum builds proficiency gradually by presenting content in a logical sequence with multiple models to solve problems, numerous opportunities for practice and application, and opportunities for students to think aloud to explain concepts and the reasoning behind the procedures.

Interventionists should be highly trained in the Mathematics K–12 Learning Standards, the Standards for Mathematical Practice, the Mathematics Teaching Practices, the core curriculum, and the supplemental curriculum.

Resources

- National Center on Response to Intervention
- What Works Clearinghouse
- What Works Clearinghouse Practice Guide for Assisting Students Struggling with Mathematics
- Center on Instruction
- Youcubed Article: Visual Math Improves Math Performance by Park and Brannon

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CLASSROOM CENTERED PRACTICES IN MATHEMATICS

Culturally Responsive Teaching

To achieve a high-quality public education for all students, all educators must be able to work effectively in diverse settings. To become effective in diverse contexts, educators must be willing to learn about systemic racism and inequities in the public education system and to develop culturally competent skills and mindsets (EOGOAC, 2017). Professional learning opportunities aimed at increasing cultural competencies are focused on increasing educators' knowledge of student cultural histories and contexts (as well as family norms and values in different cultures), developing the ability to access resources for community and family outreach, building the skills for adapting instruction to align to students' experiences, and identifying cultural contexts for individual students (RCW 28A.410.260). In accordance with best practices regarding family engagement, districts should make every effort to ensure cultural competence training programs are developed and implemented in partnership with families and communities (EOGOAC, 2017).

When considering mathematical teaching practices to reach students who have not yet met grade-level standards in mathematics, it is important to consider the positive impact of culturally responsive teaching to better support all students in mathematics. Studies have shown that culturally responsive teaching, defined as teaching that leverages students' cultural knowledge to facilitate learning, has positive effects on students' learning. Furthermore, teachers having respect for cultural diversity positively influences students' motivation to learn.

Margery Ginsberg suggests a motivational framework for culturally responsive teaching which can support learning. The framework is made up of four essential motivational conditions, which Ginsberg has found to act "individually and in concert to enhance students' intrinsic motivation to learn." The conditions are:

1. *Establishing Inclusion*—the teacher creates a learning environment in which students and teachers feel respected by and connected to one another.
2. *Developing a Positive Attitude*—the teacher creates favorable disposition among students toward learning through personal cultural relevance and student choice.
3. *Enhancing Meaning*—the teacher creates engaging and challenging learning experiences.
4. *Engendering Competence*—the teacher creates a shared understanding that students have effectively and authentically learned something they value.

Teaching mathematics with a culturally responsive lens means that the teacher creates an inclusive environment, makes the learning relevant with some aspects of student choice, plans and enacts learning activities that are engaging and challenging, and supports students in knowing what they have learned and why it is of value.

When classrooms and schools are staffed with culturally competent educators, schools are more likely to effectively work towards closing the opportunity gap and increasing student achievement overall. OSPI's toolkit was created to support educators as they integrate students' funds of knowledge in the classroom. Additional resources that support culturally responsive practices include: *Culturally Responsive Teaching Matters!*, *Culturally Responsive Classroom Management*, and *Culturally Responsive Teaching*.

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Teacher and Student Relationships

Good relationships between teachers and students help improve academic success. Students try harder, knowing someone cares about the outcomes. Students feel more comfortable seeking help when the relationship is positive and supportive. Teachers who have high expectations for their students and positive attitudes about mathematics positively influence student outcomes.

Students who report having a more supportive relationship with their mathematics teachers are willing to exert more energy learning the lesson and helping their peers. The relationships, either positive or negative, have long-lasting effects on students.

Developing a Growth Mindset

The beliefs people have about intelligence play a big role in mathematics. Some believe intelligence remains the same, harboring a fixed mindset. Others believe in a growth mindset, where intelligence changes throughout your lifetime. People with a fixed mindset believe they are good at certain things and bad at others. With a growth mindset, a person could work hard enough and become good at whatever they want.

A person with a fixed mindset and who is good at mathematics will be able to be successful most of the time, but when they come to an obstacle, they tend to give up quicker than those with a growth mindset.

Students with a growth mindset see math as something to work at. When it gets difficult, which it will, they persevere. They believe that the brain is like a muscle, the harder one works, the stronger it gets.

In this model, students are first taught about the brain and how growth mindset works. Then they apply this mindset to learning mathematics or other topics.

Explicitly teaching students how growth mindset works is a foundational skill for success. Growth mindset instruction should be an integral part of both core programs and intervention programs.

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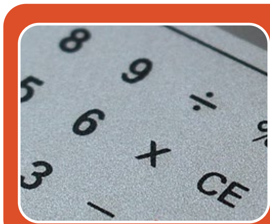
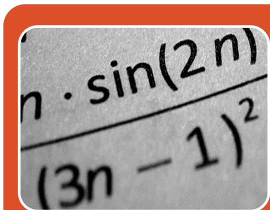
Academic Language

Academic language (also referred to as academic English, disciplinary language, scientific language, critical language, and language of school) helps define school success for all students. It is the language of textbooks and homework, the language found in assessments, and the language students hear and see in all classrooms. This language is different in register (the words, phrases, and expressions used to talk about content-specific concepts), structure, and vocabulary from everyday language. Academic language is at the heart of grade-level curriculum across content areas (Gottlieb & Ernst-Slavit, 2014). Academic language includes: vocabulary, representing information, and student discourse.



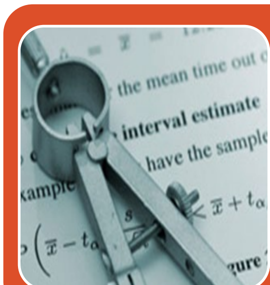
Vocabulary

- **Math Content Words:** sum, area, product
- **General Academic Words:** justify, summarize, interpret
- **Symbols**: x, y, +, -, ÷, ≠



Representing Information

- **Sentence Structure:** written responses
- **Graphics:** diagrams, graphs, charts
- **Symbols:** a + b = c, x > y, y-2=21



Discourse

- **Receptive Language Functions*:** comprehending others' talk about math approaches, coordinating texts and multiple representations, comprehending the meaning of a problem.
- **Productive Language Functions*:** describing and defending a model, explaining relationships, presenting information, responding to questions.

*Figure 2 *(Council of Chief State School Officers, 2012)*

It is important for educators to be aware of the challenges students face in mathematics with regard to academic language. Language development is not limited to vocabulary instruction but also includes "instruction around the demands of argumentation, explanation, analyzing purpose and structure of text, and other disciplinary discourse" (Zwiers et. al., 2017). To support the development of academic language in mathematics, learning environments should include speaking, writing, diagramming, and gesturing. Access to learning, that promotes conceptual development, is necessary for all students (Walqui, 2009). The Understanding Language/Stanford Center for Assessment, Learning and Equity at Stanford provides a framework addressing the demands of academic language to help teachers organize strategies to support students in mathematics.

Mathematical vocabulary is more likely than ever to have an impact on students' math success because students need to understand math-specific words, words with multiple-meanings, and mathematical symbols to develop proficiency in math vocabulary (Pierce & Fontaine, 2009). Explicit teaching should address words that have multiple meanings, concepts that can be represented with multiple terms, awareness of symbols and diagrams as they relate to mathematics, and the connection between mathematics vocabulary and everyday vocabulary (Roberts & Truxaw, 2013). To learn the math vocabulary needed for success, educators should engage students in rich and lively activities. These activities should encourage deep processing of word meanings and provide a range of opportunities to encounter math vocabulary (Pierce & Fontaine, 2009).

Teaching students to interpret and represent information in mathematics is complicated, as it requires more than reading and writing text. Students must learn to interpret and demonstrate their mathematical thinking through written explanations, symbols, and graphic representations. Educators must teach students the skills needed for success. Teaching sentence structures in mathematics is important to comprehension since often every word within mathematical texts or word problems is essential (Adoniou, 2014). Students might know the meaning of certain academic math words but, if they cannot put them in a comprehensible sentence, knowledge of academic words alone will not help them be successful (OSPI academic language toolkit).

When students engage in mathematics and are encouraged to provide meaningful explanations, higher level thinking and reasoning is promoted. Meaningful mathematical discussions help build knowledge and support the mathematical learning of all students in a math-talk community (Wagganer, 2015). The National Council of Teachers of Mathematics (NCTM, 2014) Principles to Actions includes communication as a process strand that highlights the importance of language skills in mathematics classrooms. Students need multiple opportunities to use academic language by engaging in meaningful discourse. The Common Core's Standards for Mathematical Practice (SMP) state that students should engage in discussion that constructs viable arguments–*SMP 3*, critiques each other's reasoning–also *SMP 3*, and communicates with precision–*SMP 6* (CCSSI 2010, p. 6-7). Academic discourse helps to develop conceptual understanding and improve language use (Hill & Miller, 2013). Conversations for students developing mathematical language may serve as scaffolding because opportunities to make and communicate meaning are provided (Zwiers et. al., 2017). Students benefit from collaborative discussions because mathematics conversation provides:

- Meaningful discussion.
- Oral language practice.
- A way for students to clarify what is being asked and what is happening in a problem.
- Time to process information and hear the thinking of others.
- Opportunities for teachers to model academic language, appropriate vocabulary use, thinking processes.
- Build common understandings and shared experiences (Echevarria, Vogt, & Short, 2009; Zwiers et. al., 2017).

Educators should provide structure and support for students by intentionally teaching how to participate in these types of math conversations. Students benefit from learning how to question, reason, make connections, solve problems, and communicate solutions effectively (Echevarria, Vogt, & Short, 2009).

Providing a variety of scaffolds that foster students' participation supports students both in organizing their thinking and making sense of the mathematics. Examples include:

- Sentence frames, which provide tools to support mathematical conversations.
- Teacher modeling and think-alouds.
- Word walls and posters displaying commonly used terms, operations, and math processes.
- Graphic organizers, which provide visual representations of mathematical information.
- Artifacts and manipulatives upon which to build shared meaning and support sense-making.
- Structured peer interactions, to communicate ideas and clarify understanding (Echevarria, Vogt, & Short, 2009; Zwiers et. al., 2017).

Academic language is critical to student outcomes in both mathematics and English language arts.

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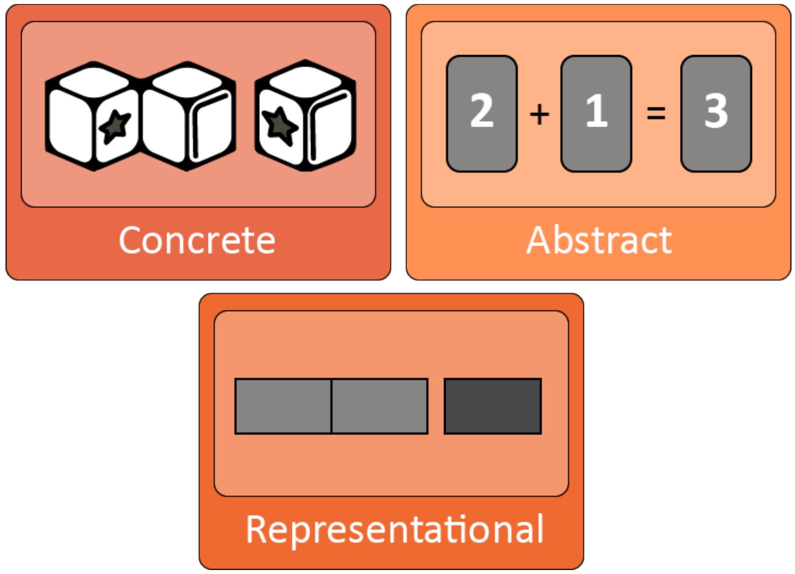
Cross-Curricular Teaching Practices

Students use many of the same skills and strategies in mathematics as they do in English language arts. Making explicit connections between strategies across content areas strengthens students' cognitive processes. To make these connections, educators should point out when a vocabulary word, skill, or strategy has a dual purpose across content areas and model these connections during instruction. One way to model cross-curricular connections is to be intentional when selecting read-alouds. For example, strategies used to make sense of complex language in a mathematical word problem are similar to the strategies used when reading informational text. Activating background knowledge supports student reading comprehension and mathematical reasoning. Students may activate background knowledge about a topic within a mathematical task the same way they would activate background knowledge while reading text. Learning explicit and systematic strategies for receiving and providing feedback benefits students across content areas. For example, providing feedback to justify a strategy used for solving a mathematical problem is similar to providing peer feedback for revisions during writing.

Mathematical Representations and Manipulatives

Mathematics instruction, at all grade levels, should develop conceptual understanding of mathematical ideas. This can be accomplished through the use of concrete manipulatives and representational models, as well as abstract representations. When planning instruction, teachers intentionally consider how to integrate concrete, symbolic, and abstract representations. Visual representations of the mathematics are critical in laying a strong foundation of mathematical ideas. Experiences using concrete manipulatives support visualizing abstract ideas. The connections students make across these representations are essential for robust understanding.



Concrete representations include physical objects and manipulatives. Representational models may be diagrams, drawings, or pictures. Numbers and symbols in mathematics are often the most abstract for students and can be connected to concrete and representational models. A student's experience should involve ample opportunity to move flexibly among the different representations.

Traditional mathematics instruction has historically focused on computation with abstract symbols. According to National Council of Teachers of Mathematics, procedural fluency includes the ability to apply, build, modify, and select procedures based upon the problem being solved. This definition of procedural fluency pushes the bounds of traditional mathematics instruction, as it requires foundational knowledge of concepts, reasoning strategies, properties of numbers and operations, and problem-solving methods.

Mathematically Productive Instructional Routines

Mathematically Productive Instructional Routines (MPIRs) are high leverage instructional routines that focus on student ideas as central to learning, make student thinking visible, and provide opportunities for mathematical discourse thereby allowing opportunities for students to make sense of mathematics. Consistently engaging students in these routines can change student's dispositions about mathematics, support shifts in instructional practice, and deepen mathematical content knowledge and a growth mindset for both students and teachers. Using these routines consistently supports teachers in focusing on student thinking, as opposed to focusing on what the teacher is doing. Moreover, routines specifically support students who are identified as requiring additional assistance or who are in need of language support.

MPIRs can be implemented with students from pre-school to college and are not tied to any curriculum. It is beneficial to use routines daily, or multiple times a week. Mathematical routines can cover many different mathematical ideas and can be used across a variety of concepts and topics.

While there are several different formats for these routines, all Mathematically Productive Instructional Routines share these common attributes:

- **They are routine.** MPIRs are brief and used frequently. Students and teachers engage in these activities often enough that the routine itself is learned and can be engaged in quickly and meaningfully. The predictable structure creates a safe time and space for students to take risks and explore and share their ideas.
- **They are instructional.** While classrooms also rely on routines designed to manage student behavior, transitions, and supplies, MPIRs are routines that focus on student learning. MPIRs provide an opportunity for students to share their mathematical ideas and make connections and deepen their understanding of math concepts as they listen and respond to other students. Routines also provide an opportunity for the teacher to formatively assess students.
- **They are mathematically productive.** Prompts for each MPIR are carefully chosen to engage students in making sense of important mathematics concepts and allow opportunities for students to enact the Standards for Mathematical Practice. Student discussions highlight central mathematical ideas. Students gain important insights and develop positive dispositions about engaging in mathematics through their participation in MPIRs.

Mathematically Productive Instructional Routines create a structure where teachers listen to, build on, and respond to student thinking. Using such routines frequently can support the development of a classroom culture in which sense-making is at the heart of all learning, and mistakes are expected, respected, and inspected. The purpose of MPIRs is to provide frequent opportunities for students to engage with mathematics in meaningful ways that deepen understanding and support a growth mindset.

Number Talks

Number Talks are an example of a mathematically productive instructional routine that can support the development of a classroom culture in which students feel encouraged to share their thinking, and teachers become skilled at listening to their students' thinking. This short mental mathematics routine can be used daily with any curricular materials to promote number fluency as well as develop conceptual understanding of numbers and operations.

In a number talk, students have the opportunity to share their thinking and learn from fellow students about multiple ways of using number relationships and structures, and visual models to perform mental computations. With number talks, teachers must listen to and represent student thinking, which not only provides them with information for determining next steps, but also deepens the teacher's own understanding of mathematics. Number talks are the best pedagogical method for developing number sense and helping students see the flexible and conceptual nature of mathematics (Boaler, 2015).

In their book, *Making Number Talks Matter*, Number Talks pioneers and researchers Cathy Humphreys and Ruth Parker claim:

> Number Talks help students become confident mathematical thinkers more effectively than any single instructional practice we have ever used.... With Number Talks, students start to believe in themselves mathematically. They become more willing to persevere when solving complex problems. They become more confident when they realize that they have ideas worth listening to. And when students feel this way, the culture of a class can be transformed.

Clothesline

This instructional routine supports students in developing and deepening their understanding of numbers and number relationships with the ability to manipulate numbers in space on an open number line. Students are also provided the opportunity to explore number relationships, equivalencies, and other mathematical concepts. Students are invited into mathematical discourse as they compare and describe relationships of different numerical values.

In the Clothesline routine, a string is displayed to represent a number line. Based on the desired topic of mathematics to be explored, algebraic expressions, angles, decimals, fractions, whole numbers, or various quantities are added to the open number line. Students move the quantities or expressions, demonstrating and developing their sense of number relationships.

Ten Minute Talks

Ten Minute Talks provide students with opportunities to verbally respond to a mathematical term, phrase, situation, or prompt, encouraging students to engage in mathematical discourse and accessing the Standards of Mathematical Practice. In this routine, after private think time, students share their thinking without guidance and feedback from the teacher. Students explore mathematical concepts with one another through rich dialogue surrounding a given topic. Students do a quick write-in response to a prompt, share with a partner, and discuss with the class to deepen their understandings. Students are encouraged to question and evaluate the reasoning of their peers without suggestion, approval, or correction from the teacher.

In order for students to openly engage in this routine, students must feel safe and secure in the learning environment, thus norms for effective and appropriate mathematical discourse should be established. The goal of Ten Minute Talks is for students to construct viable arguments and critique the reasoning of others through dialogue surrounding a given mathematical prompt.

Notice and Wonder

Notice and Wonder is a routine in which students are provided the opportunity to critique, question, and explore a given mathematical stimulus. In this routine, the teacher provides the stimulus, followed by ample think time for students to consider, *"What do you notice? What do* *you wonder?"* Students are then invited into partner conversations to take turns sharing their noticings and wonderings. Following the partner discussion is a whole group discussion focusing on the noticings. The process is repeated with wonderings and these questions can influence the focus of subsequent lessons.

The routines above provide a sampling of possibilities and teachers are encouraged to implement a few routines well in order to foster safety and access to the mathematics.

Resources

- Youcubed: Number Talks
- Estimation 180: Clothesline Activities, Resources, and Tutorials
- National Center on Response to Intervention
- Routines for Reasoning
- The Learning Space – Mathematically Productive Instructional Routines
- Teacher Education By Design

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Games

Mathematics games may be used for extended learning time to support instruction and to help students meet the state standards. Some research has found that game-based learning is an effective way to enhance motivation and performance.

Choosing which game to play depends on the instructional goal and learning target. Games can be used both for instruction and practice. Games may also give students the opportunity to apply new learning. Games may not be appropriate in all situations and are more effective if they are embedded in instruction and include debriefing and feedback. Also, games should be used as adjuncts and aids, not as stand-alone instruction.

Technology

When used strategically, technology can provide students with greater access to conceptual understanding and procedural fluency. Technology can provide students with additional representations of mathematical ideas, allow inquiry-based exploration, reinforce procedural learning and fluency, and provide efficient screening and diagnostic assessment data. Teachers must monitor student progress and adjust instruction based on formative assessment in all formats. Technology is a tool, not an intervention in and of itself. Technology alone cannot replace effective teaching or intervention activities. It must be a balanced supplement, especially with students who struggle with self-regulation and efficacy. Online mathematics programs, whether purchased or Open Educational Resources, should be aligned with the Mathematics K–12 Learning Standards, adequately scaffold learning, and provide a variety of rich and rigorous tasks.

MATH SMARTER BALANCED ASSESSMENT, LAP ELIGIBILITY, AND LAP STUDENT DATA REPORTING

Students in grades 3–8 and high school take the Smarter Balanced Summative Assessments aligned to the Mathematics K–12 Learning Standards (also referred to as "the standards"). The assessment aligns to both the Standards for Mathematical Content at each grade level and the Standards for Mathematical Practice. The state summative assessments determine students' progress toward college and career readiness in mathematics. These summative assessments consist of two parts: a computer adaptive test and a performance task.

The learning outcomes represent the mathematics content and skills that support students to be college- and career-ready by the end of their high school experience.

The evidence of students' progress toward college and career readiness is provided by student performance on the items and tasks in the four assessment categories, referred to as Claims: Concepts and Procedures, Problem Solving, Communicating Reasoning, and Modeling and Data Analysis. OSPI developed a 5-video series on the Smarter Balanced mathematics claims (scripts available on OSPI Math Assessment page) that gives an overview of what a claim is and provides further insight into each of the four claims.

Claim 1 – Concepts and Procedures: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency. (Associated Standards for Mathematical Practice: 5, 6, 7, 8)

In developing conceptual understanding and procedural fluency, students need to be aware of how concepts link together and why mathematical procedures work in the way that they do. Concepts should be built on students' prior knowledge, and students should have the opportunity to make connections between concrete and abstract representations. Students should be able to carry out procedures, describe concepts, and communicate results. The mathematical tools that are appropriate for a particular grade level should be used strategically.

Smarter Balanced Content Specifications provides rationale, evidence, and targets for mathematics Claim 1 (p. 25–40).

Sample items aligned to Claim 1 are online at the Smarter Balanced Sample Item webpage.

Claim 2 – Problem Solving: Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies. (Associated Standards for Mathematical Practice: 1, 5, 7, 8)

Problem solving sits at the core of *doing* mathematics. Students who are proficient problem solvers start by explaining the meaning of the problem to themselves and then look for an entry point. Students construct their own pathway through flexible thinking and the use of a variety of strategies, rather than having to follow a provided path to solve a problem. They use tools strategically and evaluate the reasonableness of their answers.

Smarter Balanced Content Specifications provides rationale, evidence, and targets for mathematics Claim 2 (p. 41–47).

Sample items aligned to Claim 2 are online at the Smarter Balanced Sample Item webpage.

Claim 3 – Communicating Reasoning: Students clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others (Associated Standards for Mathematical Practice: 3, 6).

The content and practice standards often describe opportunities for students to construct and present a clear, logical, convincing argument. Students should have the ability to analyze a provided explanation, identify any flaws in the explanation, and then present, if needed, a logical sequence of proof or a complete, correct argument. Rigor in reasoning is about the precision and logical progression of an argument. Communicating in precise language and symbols increases the strength of the argument.

Smarter Balanced Content Specifications provides rationale, evidence, and targets for mathematics Claim 3 (p. 48–55).

Sample items aligned to Claim 3 are online at the Smarter Balanced Sample Item webpage.

Claim 4 – Modeling and Data Analysis: Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems. (Associated Standards for Mathematical Practice: 2, 4, 5)

Real-world problems do not come neatly packaged. They often are complex and contain too little or too much information. Students often have to model the problem to better understand how to solve it. As students use this abstract model to work through a solution, they must interpret the results and check for reasonableness in the context of the original problem.

Smarter Balanced Content Specifications provides rationale, evidence, and targets for mathematics Claim 4 (p. 56–64).

Example items aligned to Claim 4 are online at the Smarter Balanced Sample Item webpage.

Smarter Balanced Assessment System

The Smarter Balanced Assessment System consists of three major components: formative assessment resources, interim assessments, and summative assessments. This complete system consists of resources to support student learning, check student progress, and measure student achievement in grades 3–8 and high school.

The Tools for Teachers provides educators with instructional formative assessment resources and professional learning resources aligned to the standards. These resources were created by educators for educators and can help guide implementation of formative assessment processes in the classroom.

Interim assessments can be used by educators and students to measure and guide student learning toward the expectations of the standards and are flexible to serve a variety of educator needs throughout the year. Interim assessments are available on the Washington Comprehensive Assessment Program (WCAP) portal.

Practice and training Tests for the Smarter Balanced mathematics assessment are available online. The training tests provide opportunities for students to practice navigating the tools and features of online testing. The practice tests provide students opportunities to experience grade-level content that mirrors the summative assessment. The Smarter Balanced Practice and Training Tests are for students and educators as they prepare for the Smarter Balanced summative and/or interim assessment. Parents and community members/partners may also find the practice and training tests valuable as opportunities to see examples of online student testing.

The summative assessments consist of two parts: a computer adaptive test and a performance task. On the computer adaptive test, the questions a student receives are dependent upon a student's correct or incorrect answers. Adaptive tests are tailored to each student individually; they provide scores that are more accurate than fixed-form assessments and identify evidence of student skills. The performance task presents a series of connected questions that assess skills from Claims 2, 3, and 4.

The Smarter Balanced Assessment Consortium consists of multiple states working together to create and submit resources and to develop assessments. More than 4,700 educators across the consortium have developed and reviewed test items, established achievement levels, and contributed resources to the Tools for Teachers.

Multiple Measures of Assessment for LAP

Students are identified as being eligible for LAP based on multiple measures or assessments. As identified earlier in the MTSS section of this report, establishing data-based decision-making protocols using a comprehensive system for assessment is important to identify and monitor students who need supplemental supports/services. The comprehensive system should include universal screening for all students, diagnostic data for students who are identified as potentially at-risk, progress monitoring, and formative assessment processes.

Washington is a local-control state and does not make recommendations on which assessments schools and districts should use to honor the needs and expectations in a comprehensive assessment system. Among others, the following assessment tools and resources are available to support districts and schools as they select assessments to support decision-making processes:

- **Universal Screening:** The National Center on Response to Intervention provides a Screening Tools Chart.
- **Diagnostic Data Collection:** The Education Resources Information Center (ERIC) and the Institute of Education Sciences provide reviews of diagnostic assessments, such as KeyMath–3 and KeyMath Revised.
- **Formative Assessment Processes:** Smarter Balanced provides access to formative assessment resources in the Tools for Teachers to Washington educators.
- **Progress Monitoring:** The National Center on Intensive Intervention at American Institutes for Research provides an Academic Progress Monitoring – General Outcomes Measures (GOM) chart.

Smarter Balanced Assessments: LAP Student Eligibility and LAP Student Data Reporting

When identifying students for services, OSPI recommends using multiple measures. Districts/schools may use Smarter Balanced assessments as one of these measures to determine student eligibility for LAP. This could include the use of the summative assessment, Interim Comprehensive Assessments (ICA), and Interim Assessment Blocks (IAB).

Smarter Balanced assessments are limited in monitoring student progress for LAP data reporting. The summative assessments are only administered once during the school year. Both the ICAs and IABs are fixed form assessments. The IABs only have a three-level classification on student performance. These features of the Smarter Balanced assessments do not provide the detail needed to monitor student progress or make determinations about student growth for purposes of LAP Data Reporting.

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Mathematics Menu

OVERVIEW

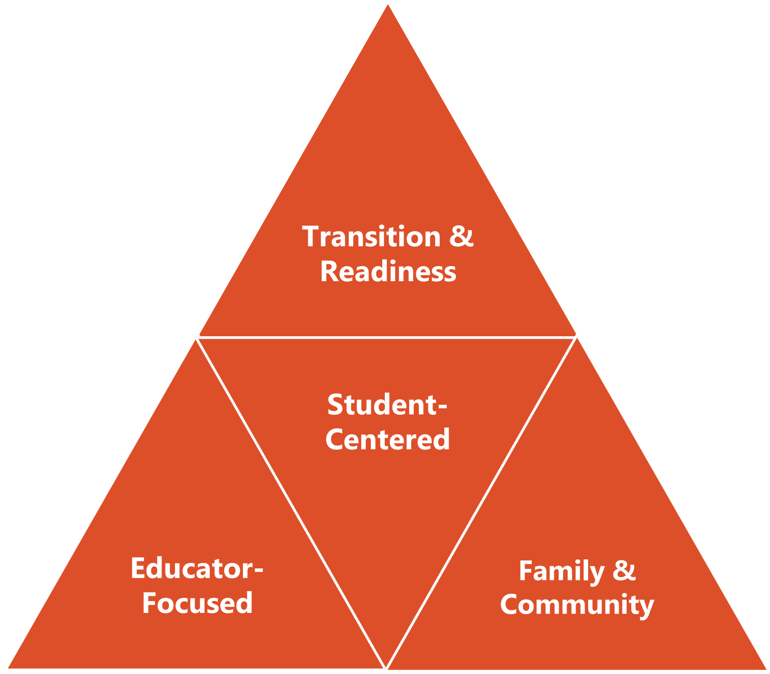
The expert panels worked together with the Washington State Institute for Public Policy (WSIPP) to develop a comprehensive menu of best practices and strategies based on the most current evidence and rigorous research available. Panelists referred to the following WSIPP definitions for evidence-based, research-based, and promising practices.

> *Evidence-based*
>
> A program or practice that has been tested in heterogeneous or intended populations with multiple randomized or statistically controlled evaluations or both; or one large multiple site randomized or statistically controlled evaluation, or both, where the weight of the evidence from a systemic review demonstrates sustained improvements in at least one outcome. Evidence-based also means a program or practice that can be implemented with a set of procedures to allow successful replication in Washington and, when possible, is determined to be cost-beneficial.
>
> *Research-based*
>
> A program or practice that has been tested with a single randomized or statistically controlled evaluation or both, demonstrating sustained desirable outcomes; or where the weight of the evidence from a systemic review supports sustained outcomes [. . .] but does not meet the full criteria for evidence-based.
>
> *Promising*
>
> A practice that, based on research evidence, a well-established theory of change, or guidance from expert panels, shows potential for improving student outcomes but does not meet the criteria for classification as an evidence-based or research-based program. The expert panels and WSIPP collaborate to identify promising practices for inclusion in the inventory and menus.

The mathematics menu lists instructional practices and strategies that have been shown to support mathematics improvement for students who have not yet met academic benchmarks. It is important to note that the work of the expert panel was to identify proven general practices and strategies, not specifically branded programs that might include those practices. Districts considering adoption of programs or curriculum are encouraged to review the materials for alignment to the Mathematics K–12 Learning Standards and the best practices and strategies outlined in this menu. Schools are also encouraged to use the IMET and EQUIP rubrics to vet alignment of the LAP instructional materials to the Mathematics K–12 Learning Standards. Any chosen program or curriculum should be evaluated on an ongoing basis to ensure it effectively impacts student achievement.

Menu Organization

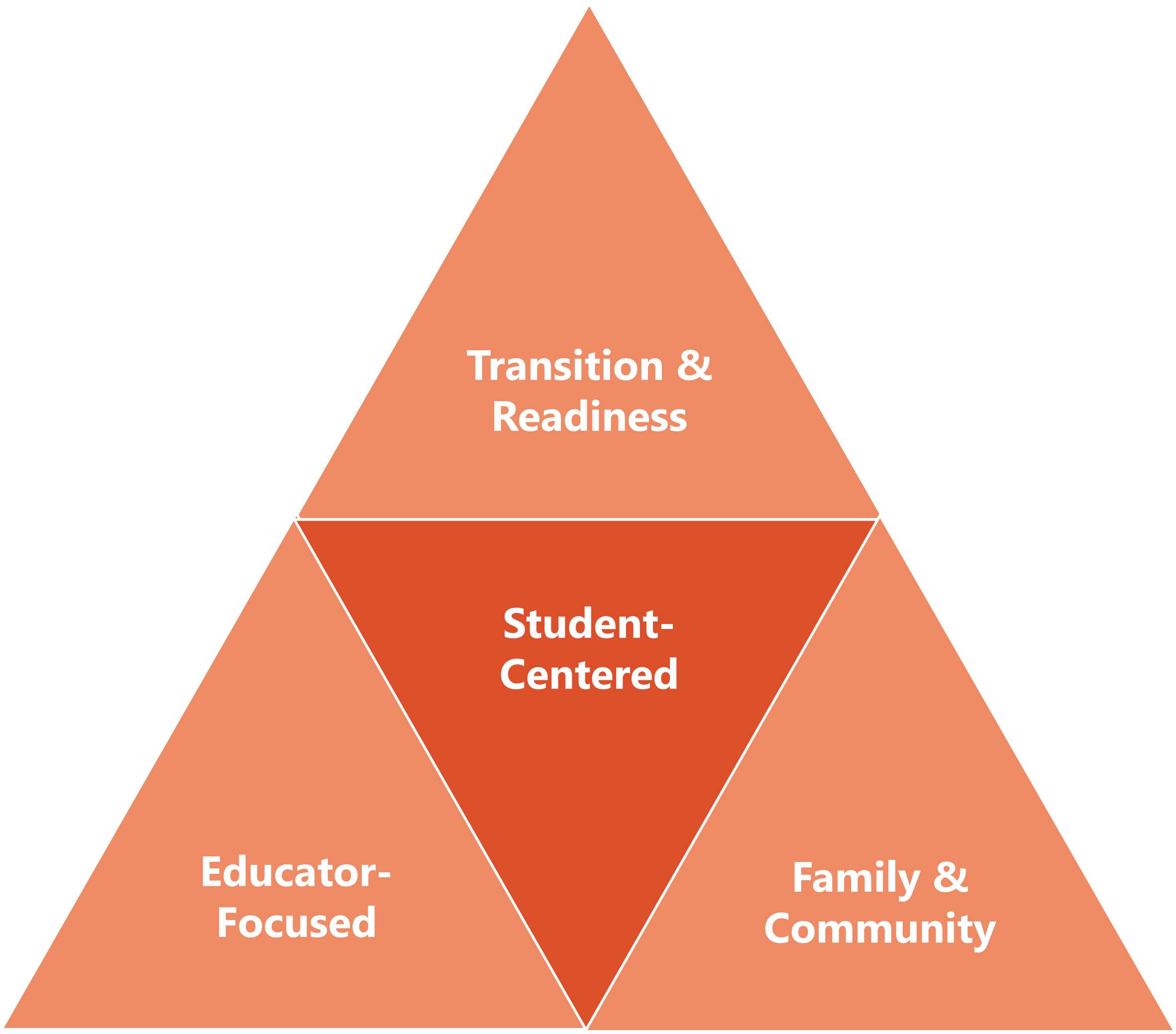
The menus have been organized into four categories of practices and strategies. Entries in the student-centered category directly involve the student (e.g., peer tutoring and summer programs). Educator-focused practices and strategies include activities such as targeted professional learning and instructional coaches. Family and community practices and strategies include mentoring or family engagement. Entries in the transition and readiness category are intended to prepare students to engage in learning, transition from middle to high school, and graduate from high school.



MATHEMATICS MENU AT A GLANCE

Student-Centered Practices and Strategies	
Double Dosing	*Evidence-based*
Summer School/Programs	*Evidence-based*
Tutoring by an Adult	*Evidence-based*
Tutoring by a Peer	*Research-based*
Educator-Focused Practices and Strategies	
Consultant Teacher/Instructional Coaches	*Evidence-based*
Professional Learning Communities	*Promising*
Targeted Professional Learning	*Evidence-based*
Transition and Readiness Practices and Strategies	
Credit Retrieval and Mastery of High School Standards	*Promising*
Grade 8 to High School Transitions	*Promising*
Kindergarten Transitions	*Promising*
Family and Community Practices and Strategies	
Family Engagement	*Promising*
Community-Based Student Mentors	*Research-based*

STUDENT-CENTERED PRACTICES AND STRATEGIES



Double Dosing (Middle and high school students only)

Double dosing provides additional time during the school day for targeted mathematics intervention with a certified teacher. This "second dose" occurs during a regular class period, and enrollment is concurrent with a regular class period of core instruction. All students in double dosing programs must be simultaneously enrolled in core instruction and the support class. Interventions are aligned with the students' identified mathematical learning needs and the grade-level math standards taught during the core instruction period.

Practice Possibilities—Ideas to Consider When Planning

- Identify what mathematical skills are needed for students to accelerate learning and align materials and instruction to those needs. Review data regularly to ensure the materials are aligned to core instruction and program strategies are effective for each student.
- Provide pre-teaching aligned to core instruction so that students can participate more fully in their core math class.
- Establish routines for goal-setting and reflection to develop students' self-regulation strategies.
- Create an additional instructional block in the master schedule for targeted interventions, more practice, and advanced learning opportunities so that students in double dose classes are not excluded from opportunities to enroll in other course offerings.
- Provide collaboration time for core and intervention teachers to co-plan.
- Pair computer-assisted skill building programs with educator support for students to provide practice, monitor student progress, and communicate student progress with families.

Demographic Considerations—Student Factors to Consider When Planning

- Students who are just below grade level proficiency experience the greatest positive impact.
- Students who are significantly below grade level may require a more intensive intervention.
- English learners (EL) benefit when instruction is in their home/primary language whenever feasible and is focused on building academic language.
- English learners may not have background knowledge to understand scenarios described in some story problems. Find ways to connect mathematics to students' funds of knowledge.

- Double dosing may not be appropriate for all groups of students. For example, one study found that African American students' achievement was lower at the end of the intervention compared to their beginning scores.

Strategies for Implementation—Success Factors to Consider When Planning

- Consider the multiple detrimental effects of tracking and streaming and create a plan to mitigate those effects.
- Create opportunities for ongoing communication between the core classroom content teacher and the intervention specialist. This is crucial for the success of this model.
- Portray double dosing as an opportunity for success by creating an environment where students can exercise choice in their selection of relevant mathematical problem and engage socially with others in learning meaningful mathematics through productive struggle and a growth mindset.
- Use cognitive tools such as graphic organizers, illustrations, concept maps, anchor charts, and pictures to support core instruction.
- Consider scheduling the double dose intervention before the core class so that educators can pre-teach the concepts and skills students will encounter in their core class.
- Select educators to teach double dose intervention who believe students can be successful in mathematics, who work closely with the core instructional educators, and who have deep pedagogical content knowledge.

Resources—Tools for Planning

- Self-Study Guide for Implementing High School Intervention
- Practice Guide: Assisting Students Struggling with Mathematics
- Academic Language Toolkit
- Advancement Via Individual Determination (AVID)
- Essential components of RTI

Supporting Research

WSIPP reviewed five studies on double dosing at the middle and high school levels. They rated this intervention as "evidence-based."

Double dosing is a strategy used most often in secondary schools to provide support to students who have not yet met grade-level standards in mathematics. Several different formats for double dosing exist. Typically, the core mathematics course is heterogeneous, and the double dose course occurs in a variety of formats such as prior to or after the regular course or during a different period of the day. The double dose intervention may be taught by the same or a different instructor (Kratofil, 2014).

In one study, the strongest impact of the double dose algebra intervention is for students that are just below grade level proficiency rather than students with the most severe gaps in mathematics. While the impact of the intervention did not result in necessarily lower rates of failing for algebra, evidence suggests an impact on future course-taking and improved graduation rates and standardized test scores for students. This is especially true if the intervention infuses supporting conceptual development with an emphasis on academic discourse along with skills development (Cortes et al., 2014).

The academic focus during double dosing should be aligned to foundational math skills and the Mathematics K–12 Learning Standards. Collaboration time among teachers is essential to develop clarity and coherence among the general education teachers and the staff members providing double dosing for students to meet math standards. The intervention team (all the adults serving the student) should determine the instructional and assessment plans for each student to meet the instructional targets. The student’s ability to articulate the learning targets, along with ongoing progress monitoring and student self-assessment, will identify when these targets are met. Students should continue to receive services until they meet the learning targets identified for them by the instructional team.

In this model, students are identified as needing support, and their responses to interventions are measured on a regular basis. All students are screened at the beginning and again during the middle of the year. Students who have not yet met math standards receive additional instruction and their progress is monitored at least once a month (Gersten et. al., 2009). The report found a strong level of evidence that explicit and systematic instruction as well as solving word problems can support students struggling with mathematics (Gersten, et. al., 2009). Proven instructional strategies with small groups of students is the best use of double dosing time.

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Summer School/Programs

Summer school/programs are evidence-based. Summer programs extend the school year into the summer months and provide enriching opportunities to develop mathematics skills. Summer programs are effective in increasing achievement when aligned to the regular school year curriculum and maintain smaller class sizes. An academic summer program has the potential to minimize learning loss and result in achievement gains.

Practice Possibilities—Ideas to Consider When Planning

- Infuse growth mindset messages and activities throughout the program.
- Design activities reflective of students' cultural backgrounds to affirm their culture and identity.
- Provide for an engaging program that has an equal focus on conceptual understanding, procedural skills and fluency, and application of the mathematics to real world situations.
- Provide opportunities for experiential learning, including outdoor education, where mathematics concepts and skills are meaningfully integrated within the learning experience.
- Create a 'summer culture' that promotes a sense of community by providing opportunities for students to work together to solve challenging mathematical tasks and problems which helps to build long-lasting social connections among participants.
- Align instruction to support the critical areas of focus that will be addressed in the upcoming year to provide students with an exposure to the core mathematical ideas and concepts.
- Align instruction to support gaps in a student's understanding of mathematical concepts and/or skills.
- Partner with local businesses and organizations to build awareness of STEM career possibilities and connections to mathematics in their work.
- Create a site-based summer school program in locations where students congregate during the summer to increase participation.

Demographic Considerations—Student Factors to Consider When Planning

- Smaller class sizes during summer programs (20 or fewer students) are more effective in producing achievement gains.

- Migratory families may benefit from full day summer programs to help with child care; high school migrant students may benefit from early evening courses that do not conflict with work schedules.
- Provide resources for students in poverty to attend and fully participate in summer programs, including transportation to and from the site.
- Consider creating partnerships with organizations and summer programs such as 21st Century, STEM programs, bilingual programs, or migrant education programs.

Strategies for Implementation—Success Factors to Consider When Planning

- Align summer instruction to the regular school-year curriculum and the Washington State Learning Standards.
- Design curriculum that is relevant, interactive, and hands-on so that students stay engaged.
- Keep student/staff ratios small and support targeted interventions for students who have not yet met grade-level standards.
- Build and maintain parent outreach, support for student learning, and buy-in. Actively involve parents and encourage participation, communication, and collaboration.
- Allow for a sufficient duration of instruction and activities (80–360 hours is recommended) to help mitigate summer learning loss.
- Familiarize teachers and/or trained professionals with the students' academic program needs.
- Provide professional learning to teachers and/or trained professionals to improve the quality and consistency of instruction in supporting best practices in mathematics instruction.
- Provide summer school opportunities over multiple summers.
- Provide teachers and/or trained professionals with professional learning that aligns with high leverage teaching practices and builds educator content knowledge in mathematics.
- Provide differentiated instruction. Instruction should be adapted to small group and individual needs.
- Partner with district food service and/or child nutrition providers to provide healthy snacks.
- Partner with transportation services to provide transportation to and from summer programs.

- Limit the use of and do not rely too heavily on online or computer-based, skill-only programs. Summer learning experiences should be multi-faceted.
- Evaluate programs to ensure the summer program is effective at improving and sustaining student outcomes.

Resources—Tools for Planning

- Student Achievement Partners: Mathematics–Focus by Grade Level
- Charles A. Dana Center: Summer-Start Academic Youth Development
- Educational Service District 105: Mathematicians Club
- Illustrative Mathematics
- NCTM: Illuminations
- American Institutes for Research: After-School Toolkit
- Institute of Education Sciences: Structuring Out-of-School Time to Improve Academic Achievement

Supporting Research

Both mandatory and voluntary academic summer programs have been shown to be effective, especially for mathematics (McCombs et al., 2011). Research shows that smaller class sizes (20 or fewer students) for summer programs are more effective in producing achievement gains, and instructional quality is directly related to improved achievement (Biddle, 2014). Summer instruction should be aligned to the regular school–year curriculum. McCombs et al. state:

> This content alignment can take two forms. First, the content of summer programs might be aligned with that of the prior grade to provide remediation on core concepts that students have failed to master. Second, the content could align to the upcoming school year so that students have previewed core concepts and have a head start toward mastery (p. 33).

Summer programs must be engaging and focus on mathematical reasoning with grade-level content. Instruction must predominantly focus on learning through innovative instruction that supports conceptual understanding of mathematical ideas and deepens students' understanding of these ideas to support growth (McCombs et al., 2011, p. 33). Summer programs should also involve parents and be of sufficient duration. Programs should be a minimum of 80 hours of instruction and may be as long as 360 hours (McCombs et al., 2011).

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Tutoring by an Adult

Quality adult tutoring practices range from evidence-based to research-based depending on the structure of the intervention. Adult tutors, when they receive specialized professional learning in mathematics instruction, are a strong supplement to a comprehensive mathematics program. Carefully selected adult tutors include teachers, intervention specialists, paraeducators, other classified personnel, and volunteers. Tutors can provide targeted one-on-one or small group instruction to meet the specific needs of students. All of these adult tutors should receive specialized professional learning in mathematics instruction and the mathematical content, concepts, and math skills they are meant to support.

Practice Possibilities—Ideas to Consider When Planning

- Tutoring may be implemented via a push-in model, wherein intervention is provided by an adult tutor within the classroom.
- Target specific concepts and skills; those concepts and skills should be the ones identified by reliable, ongoing assessment data as areas of needed growth for students.
- Tutoring may be implemented via a pull-out model, wherein the student is removed from non-core classes in order to receive extra support or instruction. All students must have access to core instruction; therefore, all pull-out tutoring models must be provided outside core instructional time.

Demographic Considerations—Student Factors to Consider When Planning

- At-risk students or students with learning disabilities benefit from adult tutoring, especially when the adult tutor receives extra training, targeted materials, and when the intervention is intensive.
- English learners would benefit from adults who speak their primary language.

Strategies for Implementation—Success Factors to Consider When Planning

- Align to core grade-level classroom instruction and never replace core instruction.
- Include clear guidance and professional learning for the tutor, with training centered on best practices in mathematics instruction and understanding of the mathematics content and strategies to support learning of the content.
- Engage tutor and tutee in rich mathematical tasks, and use the standards for mathematical practice (problem solving, reasoning, and discourse) to guide interactions, as opposed to being primarily skill-based.
- Be purposeful and intentional in the development of adult tutoring procedures and processes. Having clear and consistent communication with the teacher, and available resources such as written lesson plans, sample scripts, pre-generated guiding questions,

etc., will increase the likelihood that students who require more intensive mathematics instruction will develop proficiency.

- Design and implement a program where knowledge is constructed from the integration of previously learned and newly acquired concepts and skills.
- Computer assisted learning programs can be paired with adult tutoring models but should not replace adult tutoring interventions.
- Ensure opportunities for collaboration and ongoing communication with the classroom teacher and program administrator to support short-term and long-term improvement. A continuation of communication should extend to each stakeholder in the individual child's education, including the parents/guardians.
- Using one-on-one tutoring and small-group tutoring (3–6 students) has positive effects on student achievement when shorter sessions are implemented 3–4 times per week.
- Tutoring by an external provider with limited connections to core classroom instruction is not recommended.

Resources—Tools for Planning

- PBS: When to Get a Math Tutor for Your Child
- National Education Association: Evaluation of the Cleveland Scholarship and Tutoring Program 1998–2002

Supporting Research

In WSIPP's inventory of evidence-based and research-based practices, Bania et al. (2014) found one-on-one tutoring by an adult in a structured tutoring program to be evidence-based with a 75 percent chance that benefits will exceed costs. This benefit-cost percentage indicates that the benefits to anticipated future economic measures for the taxpayers of Washington state outweigh the costs of implementing a structured one-on-one tutoring program. See WSIPP's technical documentation about their benefit-cost methodology for a more thorough discussion of their benefit-cost determinations.

Results indicated small-group instruction is effective for at-risk students and students with learning disabilities. Lou et al. (1996) determined that small-group instruction was most effective when groups consisted of three to four students. Elbaum et al. (1999) found that small groups outperformed students in 23 whole-class instruction settings by 1.5 standard deviations.

Ellis' research (2014) provided empirical evidence that a significant relationship exists between the intervention of small-group tutoring and students' mathematics achievement scores. Results for the correlations showed significant, positive differences in achievement scores for students in the experimental group who received the treatment of small group tutoring as compared to students in the control group who did not receive the treatment.

Research regarding push-in and pull-out tutoring models has been done extensively for English language arts and reading interventions; lessons from this research should be considered for mathematics tutoring. Push-in tutoring generally is implemented in one of two ways. In one approach, the tutor works with an individual or a group of students within the core class to provide additional help and instruction on the teacher's lesson given to the whole class. In another common model, as documented by Shanahan (2008), the tutor provides intensive re-teaching of targeted lessons during the core class. If the push-in model of tutoring is implemented, Shanahan (2008) states it must be targeted, based on student learning data, and aligned carefully to curriculum used by the classroom teacher. The pull-out model should never replace core instruction. Shanahan (2008) found with the pull–out model of tutoring, careful planning, and communication between classroom teacher and tutor are key to the effectiveness of the intervention. Allington (1994), Davis and Wilson (1999), and Dawson (2014) found a lack of coordination and communication between teacher and tutor to be a common weakness of both the push–in and pull–out models.

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Tutoring by a Peer

Peer tutoring is a research-based practice. It is a term that has been used to describe a wide array of tutoring arrangements, but most of the research on its success refers to students working in pairs to help one another learn material or practice academic tasks. Peer and cross-age tutoring are effective in developing both mathematical skills and concepts, while at the same time providing social benefits for tutors and the students they tutor. Peer and cross-age tutoring increase opportunities for immediate feedback and support during learning. Peer tutoring is more focused and intentional than peer collaboration or cooperative groups where students work together in small groups to solve mathematical problems. Reciprocal peer tutoring allows the tutor and tutee to alternate roles to increase learning. In reciprocal peer tutoring, students are partnered based on the goal of the activity. LAP funds can be used to support peer tutor training to establish routines and structures.

Practice Possibilities—Ideas to Consider When Planning

- Design activities/tasks where peers can work together on rich mathematical problems (not solely skill-based problems), which supports increased mathematical understanding, social-emotional skills, and effective communication.
- Recruit volunteer site coordinators to work with educators to develop structured peer tutoring routines. Provide regular training for peer tutors and provide guidance by designing an easy to follow template for tutors.
- Develop a training manual and/or anchor posters about tutoring routines to provide guidance and support for peer tutors.
- Recruit volunteer peer tutors from high schools, local colleges, universities, and educator preparatory programs.

Demographic Considerations—Student Factors to Consider When Planning

- Students selected as tutors will need training for success; therefore, this may work best with mid-elementary through high-school level students.
- Reciprocal tutoring may help with balance of power and social status among students.
- English learners may benefit from peer tutors who speak their primary language.
- Peer tutoring can be implemented in small group settings or whole class configurations.

Strategies for Implementation—Success Factors to Consider When Planning

- Train educators to implement peer tutoring into teaching routines and structures.
- Train student tutors to model study skills, communication skills, work habits, questioning skills, and other helpful educational behaviors.

- Provide training to peer tutors in the practices of following directions, using prompting and reinforcement, and providing effective feedback.
- Teach tutors social behaviors that allow for an appropriate, effective learning interaction.
- Select topics for tutoring where a student needs extra practice and support based on which standards or clusters students have deficiencies.
- Engage tutor and tutee in rich mathematical tasks, and use the standards for mathematical practice (problem solving, reasoning, and discourse) to guide interactions, as opposed to being primarily skill-based.
- Develop peer tutors' strengths in content, skills, and cultural competencies.
- Incorporate a motivation system for students to use during peer tutoring time.
- Use heterogeneous groups to increase effectiveness in peer tutoring.

Resources—Tools for Planning

- Education Northwest: Peer and Cross-Age Tutoring
- The Teaching Channel: ELL Peer-to-Peer Tutoring
- Intervention Central: Peer Tutoring in Math Computation with Constant Time Delay

Supporting Research

Research shows that peer tutoring is widely supported because it improves learning for both the tutor and the student receiving the tutoring (Topping 2008). Hattie (2009) noted that peer tutoring has numerous "academic and social benefits for both those tutoring and those being tutored." Peer tutoring is especially effective in improving peer relationships, personal development, and motivation (Topping, 2008). Students who have not yet met standard benefit from peer feedback and support in their computational abilities, and peer tutoring "holds promise as a means to enhance problem–solving abilities" (Baker, Gersten, and Lee, 2002).

In addition to one-on-one peer tutoring or cross–age peer tutoring in which the roles of tutor and tutee are static and defined by ability or age, reciprocal peer tutoring can also be used to increase learning time. Reciprocal peer tutoring is an intervention strategy where students alternate between the tutor and the tutee. Most importantly, when implementing reciprocal tutoring arrangements, administrators should combine organized structures and group–reward contingencies to experience positive results (Fantuzzo and Rohrbeck, 1992). The teacher who is monitoring the peer tutors should determine the selection of tutoring groups based on the goal of the activities.

Peer and cross-age tutoring, done effectively, can support students' learning, not only in mathematics but also in multiple academic and social-emotional areas.

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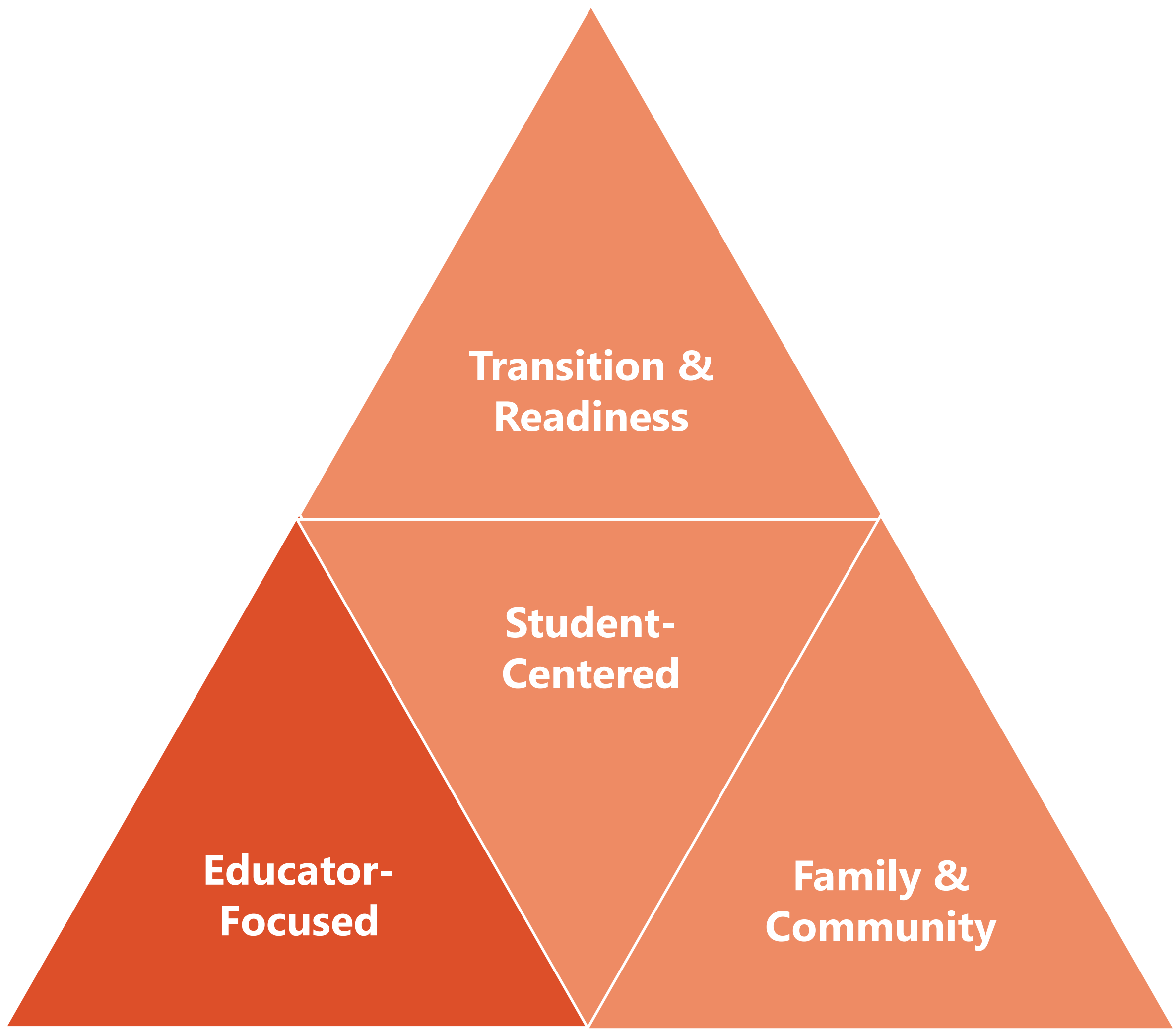
EDUCATOR-FOCUSED PRACTICES AND STRATEGIES



Consultant Teachers/Instructional Coaches

Consultant teachers are evidence-based. Consultant teachers are defined as mathematics specialists, or mathematics instructional coaches, who work with educators. These instructional coaches partner with teachers to help them incorporate research-based instructional practices into their teaching to improve student learning. Coaches work 1:1 with classroom teachers or with teams of teachers to target specific professional learning. The goal is to increase educator instructional expertise and to effectively impact outcomes in mathematics for LAP-served students struggling to meet mathematics standards.

Practice Possibilities—Ideas to Consider When Planning

- Improve mathematics programs at the school and district level through mathematics-focused instructional leadership skills development.
- Provide data coaching by training staff, professional learning communities, grade level teams, and/or individuals on how to use universal screeners, diagnostic assessments, formative assessment processes, and progress monitoring tools. Model, co-assess, and provide feedback as educators assess students and use data for planning instruction.
- Establish coaching cycles, based on grade level need, where an instructional coach models differentiation strategies in the classroom, then coaches educators to implement strategies through ongoing non-evaluative feedback as educators master strategies.
- Support educators (classroom teachers, paraeducators, volunteers, etc.) through a push-in model. Coaches will observe, co-plan, co-teach, etc., to develop educator mathematical skills and strategies.
- Provide job-embedded support directly to classroom teachers in both mathematics content and pedagogy.
- Utilize professional learning communities to collaborate with mathematics instructional leaders to create an action plan for school improvement.
- Mentor and collaborate with all teachers regardless of experience level to support shifts in mathematics instruction and mindset.
- Utilize professional learning communities with teachers to review student work, anticipate student misconceptions, and deepen teachers' own mathematical content and knowledge.

Demographic Considerations—Educator Factors to Consider When Planning

- Instructional coaches must be proficient in Washington State Learning Standards for Mathematics.
- Instructional coaches must be proficient in research-based teaching strategies.

- Instructional coaches must be proficient in diagnostic assessments, progress monitoring and data analysis.
- Instructional coaches must be able to provide job-embedded professional learning that helps teachers to enact research-based pedagogies that support students who have not yet met standard.

Strategies for Implementation—Success Factors to Consider When Planning

- Select coaches who are well-versed in both mathematics and pedagogical content.
- Select and support instructional coaches who are skilled communicators and are able to build relationships with all educators.
- Ensure that coaches are able to take a collegial role and provide feedback to colleagues to strengthen practice and support student learning in a non-evaluative way.
- Increase the amount of time coaches are able to coach teachers by limiting the number of non-instructional tasks coaches are asked to complete.
- Provide professional learning for coaches focused on improving coaching practices and deepening knowledge of teaching practices and content.
- Ensure that coaches are able to serve as leaders in the school and/or building.
- Commit resources to provide coaching for at least three consecutive years for maximum benefit.

Resources—Tools for Planning

- Center for Strengthening the Teaching Profession: Teacher Leadership Framework
- Association of Mathematics Teacher Educators: Standards for Elementary Mathematics Specialists
- National Council of Supervisors of Mathematics: Resources for Coaches
- The Math Coach Field Guide: Charting Your Course
- Instructional Coaching Group: Teaching Tools
- Inside Mathematics: Tools for Coaches
- Education Northwest: Mathematics Interventions: What Strategies Work for Struggling Learners or Students with Disabilities?

Supporting Research

Recent reports have suggested that school-based mathematics specialists, leaders, or coaches may support the improvement of mathematics teaching and learning in schools by targeting teachers' understanding and action (e.g., National Council of Teachers of Mathematics, 2000;

National Mathematics Advisory Panel, 2008; Kilpatrick et al., 2001). The intent is for a knowledgeable colleague with a deep understanding of mathematics and of how students learn, as well as pedagogical expertise, to serve as an on-site resource and leader for teachers.

The role of a mathematics coach is to break the culture of teacher isolation whereby teachers work in private, without observation or feedback, and to collaborate with other professional learning efforts in order to increase a school's instructional capacity (Neufeld & Roper, 2003). A mathematics specialist may serve as a coach while also being expected to advance their school or district's mathematics program (Campbell & Malkus, 2013).

Instructional coaches partner with teachers to help them incorporate research-based instructional practices into their teaching. They are skilled communicators who work with teachers to improve student learning. A mathematics coach is an individual who is well versed in mathematics content and pedagogy, and who works directly with classroom teachers to improve student learning of mathematics. An instructional coach must be prepared to take on a collegial, non-evaluative role and serve as a leader in the school and/or building. Mathematics instructional coaches may be expected to:

> [u]se mathematics-focused instructional leadership skills to improve mathematics programs at the school and district levels, e.g., serve as coach/mentor/content facilitator – providing feedback to colleagues to strengthen practice and improve student learning; develop appropriate classroom- or school-level learning environments; build relationships with teachers, administrators and the community; collaborate to create a shared vision and develop an action plan for school improvement; establish and maintain learning communities; partner with school-based professionals to improve each student's achievement; mentor new and experienced teachers to better serve students. (AMTE, 2013, p. 9)

This definition describes the expectations for an effective mathematics coach. According to Polly, Mraz, and Algozinne (2013) and the Association of Mathematics Teacher Educators (2013), the coach must be specifically skilled/knowledgeable in the following areas to achieve these expectations:

- Leadership
- Learners and learning
- Mathematics content
- Mathematics curriculum and assessment
- Mathematics standards

- Research-based mathematics pedagogy
- Adult learning theory

The role of a coach is different from the traditional roles found in schools. Coaches support the work of teachers and are not administrators or evaluators. Coaching thrives in a context in which there are positive relationships and a sense of community in the school; in other words, schools that recognize the importance of human and social capital (Leana & Pil, 2006). Campbell and Malkus found that teachers are more likely to turn to a teacher leader in their school for help and advice in teaching mathematics than to a principal or other administrator (2013).

Coaching holds much promise and potential; it provides the support that enables teachers to design and implement the best possible instruction for their students. It is based on a model that identifies the teacher as a reflective professional responsible for making decisions about how to best structure instructional experiences for students. "Research on instructional coaching, both in general and in specific content areas such as literacy and mathematics, has found that coaches are associated with significant gains in both teachers' adoption of reform-based pedagogies, as well as student learning outcomes" (Polly, Mraz, & Algozinne, 2013, p. 306). The Vermont Mathematics Initiative is an example of a mathematics coaching program that supports a corps of mathematics instructional coaches for grades K–8. Research shows that the Vermont Mathematics Initiative (VMI) has had a major impact on teachers, students, and classroom practice. Students in VMI schools outperformed those in control schools, and the opportunity gap has narrowed between free- or reduced-lunch eligible students in VMI schools and their non-eligible peers in matched schools (AMTE, 2013).

Campbell and Malkus conducted a study of the impact of coaching and mathematics specialists on student achievement in grades 3, 4, and 5 as measured on state standardized tests in 36 schools from five school districts. They compared schools that were similar in demographics and past performance in mathematics who were assigned a full-time math specialist for three years with schools with a full-time mathematics specialist for one year, and with schools with no specialist. They found that in all three grades, on average, students who were in schools where there was a mathematics specialist for three years scored significantly higher than students who were in schools with a mathematics specialist for only one year, or students in schools with no mathematics specialist. Additionally, there was no significant benefit to students of having a mathematics specialist for only one year (Campbell & Malkus, 2013).

The impact of mathematics coaching can be improved by increasing coaching time, providing targeted professional learning, and ensuring that there is a common vision within an instructional framework.

The simplest way to improve the effectiveness of a coaching program is to increase the amount of time coaches are actually coaching. Successful coaching programs value the time of coaching. This seems obvious, but the most frequent concern raised by many instructional coaches is that they are asked to complete so many non-instructional tasks they have little time left to work with teachers. Because instructional coaches' job descriptions are often vague or nonexistent, and because their schedules are more flexible than the schedules of others, they often are asked to do many administrative or non-instructional tasks.

Professional learning for coaches should address at least two subjects. First, coaches should engage in various professional learning activities designed to improve their coaching practices. Second, professional learning for coaches should deepen their knowledge about the teaching practices and content they are sharing with teachers. When teachers are provided with opportunities to learn more about the content they teach and how to teach it, there tends to be improved student learning (Darling-Hammond & McLaughlin, 1995).

A common vision and goals within an instructional framework that helps establish a roadmap for teachers is critical to the success of mathematics instructional coaching. Teachers should have high expectations for students, and the school should support teachers as learners. For an instructional coach to be effective, teachers must be open to feedback and reflection. The school should have a supportive principal who understands and values coaching. "[C]oaches have identified their relationship with the principal as a key factor for success" (Bean & Zigmond, 2006).

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Professional Learning Communities

Professional Learning Communities (PLCs) are promising. PLCs capitalize on the positive effects of collaborative learning. PLCs can be defined as a group of teachers, administrators, coaches, or school staff that meet on a regular, planned basis with a goal of collaboratively improving academic practices in the classroom and school in order to support mathematical outcomes. For a PLC to be funded through LAP, the goal must be to support LAP-served students. The support can include determining instructional supports, differentiating instructional practices, implementing an early warning system, and developing formative assessment processes to support student growth.

Practice Possibilities—Ideas to Consider When Planning

- Establish PLCs with a shared vision and goals focused on student learning and educator professional learning. Invite paraeducators, special education staff, educators who support English learners, behavior specialists, and interventionists to participate. Educators will identify the math skills students need to improve to effectively support student outcomes in mathematics and identify which skills are needed for continued professional learning for staff. PLCs will develop a learning plan for educators to acquire these skills to support students who have not yet met math standards.
- Use PLC time to focus on best practices and strategy implementation (math progressions, working with tutors, progress monitoring, etc.) for students served by LAP. Develop a learning plan, establish observable success criteria, and schedule walk-throughs for PLC members to observe colleagues implementing best practices. Use PLC time to share self-reflections, discuss observations, and provide feedback to improve implementation effectiveness.
- Meet bi-weekly or monthly to review student work and focus on those who have not yet met grade-level standards, anticipating student misconceptions, and identifying instructional strategies teachers will use to support student learning in mathematics.
- Design PLCs with a focus around the standards/claims/math practices, formative assessment processes, and student progress monitoring. Use common formative assessments as a resource to inform educator professional learning needs, and to develop targeted intervention plans for students who have not yet met grade-level standards.

Demographic Considerations—Educator Factors to Consider When Planning

- English language learners and culturally and linguistically diverse students could benefit from culturally responsive classroom strategies that are integrated into pedagogical approaches as a result of focused learning on cultural competency in a PLC.
- Adult instructional practices improve when educators intentionally identify and implement practices, strategies, content and assessments that engage and represent the needs of all learners, including historically underserved or underrepresented students.

Strategies for Implementation—Success Factors to Consider When Planning

- Create a collaborative culture: classroom, building, district, and region.
- Address specific cultural differences through PLCs to promote a collegial understanding of the demographics of the school, district, and community.
- Develop collaborative teams who work interdependently and hold each other mutually accountable to achieve a clear and shared: mission, vision, values, and goals.
- Invite support staff to PLCs to increase awareness of the needs of the population(s) identified and discuss how to support students through targeted academic and non-academic strategies.
- Implement a continuous improvement model that focuses on outcome data. Ensure educators review formative and summative data regularly to monitor student progress. Review and adjust educator practice when students are not demonstrating growth.
- Focus on a single theme or idea frequently, over an extended period of time, rather than expending energy on ad hoc individual student work.
- Align with current frameworks or initiatives such as Teacher/Principal Evaluation Project (TPEP), school improvement plans, and National Board certification to improve educator effectiveness.
- Focus on reviewing student work, anticipating student misconceptions, and identifying instructional strategies educators will use to support student learning.
- Establish a regular schedule for collaboration time with clear objectives for each session to support students who have not yet met standard in mathematics.
- Provide initial and ongoing professional learning for all PLC participants.
- Establish clear agendas and protocols to maximize the effectiveness of the PLC.

Resources—Tools for Planning

- All Things PLC
- Marzano Research: Tips from Dr. Marzano – Collaborative Teams That Transform Schools

- Rutgers University Center for Effective School Practices: Measurement instruments for assessing the performance of professional learning communities
- Learning Forward: The Professional Learning Association
- K–12 Blueprint: Professional Learning
- Regional Educational Laboratory Program: Professional learning communities facilitator's guide for the what works clearinghouse practice guide: Teaching academic content and literacy to English learners in elementary and middle school
- Smarter Balanced Digital Library: Formative Assessment Process Modules

Supporting Research

A professional learning community, or PLC, can be defined as a group of teachers, administrators, coaches, or school staff (or a combination of people in these roles) that meets on a regular, planned basis with the explicit goal of collaboratively improving practices in the classroom, school, and/or district in order to improve student learning outcomes. PLCs must be based on clearly articulated, shared goals for student achievement and school improvement (DuFour & DuFour, 2012). An effective professional learning community is more than just a given group of educators learning together—rather, it is a process of continuous improvement that requires engaged inquiry, reflection, planning, analysis, and action (DuFour & DuFour, 2012; Killion & Crow, 2011). The goal of PLCs is to improve the effectiveness of educators in order to directly impact student learning.

Educators working as part of a professional learning community should work collaboratively in alignment with the school's comprehensive improvement plan. To establish an effective PLC, educators must develop an agreed upon set of norms. Developing norms together, sets the stage for the collaborative culture needed for PLC success. Collaborative PLCs encourage sharing, reflecting and risk taking. Teams who are not trained to have collegial conversations may become frustrated, resulting in less productive PLCs. Educators need skills for facilitation, having collegial conversations, building shared norms, and discussing teaching practices (Wood, 2007). Examples of how educators can deprivatize practice include, but are not limited to: lesson sharing, establishing and using protocols, peer observation and reflective dialogue, as well as examining research around best practices. Blankstein (2010) suggests six essential principles for schools with PLCs:

- Common mission, vision, values and goals;
- Ensure achievement for all students;
- Collaborative teaming focused on teaching and learning;
- Using data to guide decision making and continuous improvement;
- Gaining active engagement from family and community; and

- Building sustainable leadership capacity.

Once the foundation of trust is in place, the PLC team can support the evaluation of student learning data and focus on a clear set of goals to improve student achievement.

In order for professional learning communities focused on improving outcomes for students to be successful, they must have strong administrative support (Akopoff, 2010). According to Barton and Stepanek, "Principals exert considerable influence over the successful implementation and continued functioning of PLCs." School leaders can support PLCs by building a climate of trust and mutual respect, supporting de-privatization of practice and professional growth (Little, 1993, Kruse, Louis, and Bryk, 1995, and McLaughlin and Talbert, 2001). Key success factors include creating time for teams to focus on student data, observe and reflect on instructional practices, and plan interventions for students who have not yet met standard (Reynolds, 2008). Jones et al., (2013) emphasize the role of the school principal in facilitating PLCs, being an instructional leader who models what they want educators to do, and facilitating a positive school learning culture. For teacher collaboration to be meaningful, DuFour (2008) highlights that leaders ensure:

- Teachers have time to meet built into the schedule,
- Clear priorities are given for collaboration,
- PLC participants develop an appropriate knowledge base for decision making,
- Professional learning is provided and differentiated for teacher participants, and
- Clear expectations for assessing instructional impact on student achievement are made.

Providing a clear framework for how a school's professional learning communities fit into the larger districtwide goal of improving student achievement can help build leadership capacity. PLCs can also reach beyond the building level to provide collaboration and support districtwide. Forming collaborative teams across the district develops a collective responsibility for student learning and it leverages educator expertise from across the district (Barton & Stepanek, 2012; DuFour & Reeves, 2016).

The fundamental purpose of PLCs is to transform traditional school systems by establishing collaborative cultures focused on building capacity for continuous improvement. These collaborative cultures welcome new ways of thinking and learning (Fullan, 2006). Therefore, collaboration must be embedded into the school culture as an essential component. According to Darling-Hammond et al. (2009), collaboration is one of four characteristics of professional learning that positively impacts student achievement. DuFour and Reeves (2016) draw attention to four essential questions that drive the work of collaborative PLCs:

1. What do we want students to learn?
2. How will we know if they have learned it?

3. What will we do if they have not learned it?
4. How will we provide extended learning opportunities for students who have mastered the content?

Educators working in an effective PLC, driven by the guiding questions above, must continually reflect on the ways they are working together to explore which practices are leading to effective results and to ensure that each practitioner has the skills and support to get there (DuFour & Reeves, 2016).

PLCs are action oriented and have a strong focus on bridging the knowing-doing gap (DuFour & DuFour, 2012). Using a continuous improvement model, educators participating in a PLC review each action and evaluate it for effectiveness. In other words, effective PLC teams focus on evaluating student learning data, a shared vision, and a clear set of goals to monitor progress impacting student achievement (Nelson, et al. 2010, Jacobson, 2010). A shared focus on learning, collaboration, and reflective dialogue put into practice through a cycle of continuous improvement expands educator knowledge and practice which can result in enhanced student learning (Dimino, Taylor & Morris, 2015, Fullan, 2006). Hord and Sommers (2008) note that PLC success depends on the application of what is learned about practice.

PLCs should pursue measurable goals and evaluate the success of these goals by looking at evidence of student achievement (DuFour, 2004). When professionals form a collaborative learning community with an explicit shared focus on student achievement and school improvement goals, they purposefully engage in professional learning that has tremendous potential.

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Targeted Professional Learning

Targeted professional learning refers to an evidence-based practice that focuses on improving teaching practices in a particular content area and/or a particular grade level in order to support student learning. Targeted professional learning should be explicitly aligned to student learning goals, student achievement, and school improvement. The focus of targeted professional learning, when funded by LAP, should include a focus on high leverage teaching practices and deepening teachers' content knowledge of mathematics and strategies that will support students who have not yet met grade-level standards.

Practice Possibilities—Ideas to Consider When Planning

- Implement Studio Classroom Days among grade level teams to include group collaboration, observation, and reflection with a focus of improving outcomes for students served by LAP. The mathematics Studio Classroom or Studio Day is a form of professional learning designed to support teacher reflective practice and the transfer of specific instructional strategies from workshop learning to classroom and intervention practice. All mathematics studio work emphasizes deepening teachers' knowledge of the content needed to effectively teach mathematics.
- Use student data to guide instruction that has a positive impact on student achievement. Train teachers to collect and use data to inform student learning goals.
- Provide professional learning in areas that support student academic growth:
    - Formative assessment: The process used during instruction to provide ongoing, actionable feedback to improve student success.
    - Growth Mindset: A mindset that helps students learn mathematics by understanding research around the brain as a muscle.
    - Number Talks: An instructional routine that supports a classroom culture in which students feel encouraged to share their thinking and learn from peers about multiple ways of using number relationships and structures, and visual models to perform mental computations.

Demographic Considerations—Educator Factors to Consider When Planning

- Teachers seeking to improve their instructional practices, possibly determined by TPEP or student data, can benefit significantly from targeted professional learning.
- New teachers developing their classroom instructional strategies can augment their recent formal training with targeted professional learning to help implement best practices in instruction and deepen their own mathematical content knowledge to support differentiated instruction.

- Adults who support student growth goals, such as adult tutors or paraeducators, benefit from targeted professional learning in mathematics standards and evidence-based teaching practices, such as Mathematics K–12 Learning Standards, NCTM's Principles to Actions, growth mindset, formative assessments, and Number Talks; which helps them more fully integrate their support with core instruction and provide high-value support to students struggling to learn mathematics.

Strategies for Implementation—Success Factors to Consider When Planning

- Ensure that professional learning is job embedded and lasting, providing context and focus for the learner.
- Focus on the modeling of instructional strategies for teachers and opportunities for applied practice that builds knowledge of content.
- Create opportunities to build collaborative relationships among teachers that supports networking.
- Align professional learning with school improvement goals and the Washington State Learning Standards for Mathematics.
- Skilled facilitators should lead professional learning offerings.
- Professional learning must be sustained and ongoing to support growth in best practices with instruction and to deepen teachers' content knowledge. It must include theory, demonstration, practice and feedback, and classroom support.
- Focus on specific data, mathematics skills, or instructional strategies rather than a general approach.

Resources—Tools for Planning

- NCTM: Tools for Classroom Instruction
- Youcubed at Stanford University: Growth mindset professional learning
- Achieve the Core
- Smarter Balanced Digital Library
- OSPI: Number Talks Webinars

Supporting Research

Mathematics teaching practices must promote deep learning of mathematics. The National Council of Teachers of Mathematics recommends eight Mathematics Teaching Practices for strengthening the teaching and learning of mathematics (NCTM, 2014a) that are critical for all education professionals working with students who have not yet met standard. A comprehensive system of professional learning that addresses instructional approaches is necessary to "help teachers understand the difficulty and complexity of implementing new practices" (Killion, 2013). These teaching practices are described earlier in this menu and include establishing mathematics goals to focus learning, implementing tasks that promote reasoning and problem solving, using and connecting mathematics representations, facilitating meaningful mathematics discourse, posing purposeful questions, building procedural fluency from conceptual understanding, supporting productive struggle in learning mathematics, and eliciting and using evidence of student thinking. "To create dynamic, engaging, high-level learning for students, teachers' expertise must expand well beyond basic content knowledge and pedagogy" (Killion, 2013).

Mathematics professional learning should be rich in learning experiences that deepen teachers' content knowledge. This content knowledge should be related to the content taught as opposed to advanced mathematics content, such as calculus.

A recent review of the most current research on best practices in professional learning, *Professional Learning in the Learning Profession* (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009), notes that professional learning is most effective when it is targeted to address specific content that has been explicitly tied to goals for student achievement and school improvement. Professional learning shown to improve student achievement is focused on "the concrete, everyday challenges involved in teaching and learning specific academic subject matter, rather than focusing on abstract educational principles or teaching methods taken out of context" (Darling-Hammond et al., 2009). Further, effective professional learning should be aligned to learning standards and/or instructional strategies, and must be aligned to the needs of learners.

According to Joyce and Showers (2002), professional learning should consist of a continuum in which participants receive a presentation of the theory, see demonstrations, practice and receive feedback around an applied practice, and are ultimately provided with coaching or other classroom supports to self-evaluate with the goal of positive growth. In a study by Weiss and Pasley (2006), it was found that "impacts on teachers and their teaching were typically evident after approximately 30 hours of PD, with further impacts detected through 80 hours of PD" (p. 14). But as Garet et al. (2001) state, "[a] professional development activity is more likely to be effective in improving teachers' knowledge and skills if it forms a coherent part of a wider set of opportunities for teacher learning and development" (p. 927).

Evidence suggests that, in order to positively impact student achievement, professional learning must be contextualized and sustained; that is, effective professional learning must be provided as an ongoing, systematic process informed by evaluation of student, teacher, and school needs, and embedded within a comprehensive plan for school improvement (Darling-Hammond et al., 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). As noted by McREL's (Snow-Renner & Lauer, 2005) report *Professional Development Analysis*, professional learning that is long lasting, content focused, and based on student and teacher performance data takes more time and effort to implement when compared to less effective types of professional learning. Innovative professional learning that is transformative for teachers—that helps teachers reconstruct their practice in order to promote more lasting, conceptual student learning—is far more extensive and demanding (Thompson & Zeuli, 1999). Instead of "make it and take it" workshops, or formulaic introductions to new teaching techniques, transformative professional learning asks teachers to carefully scrutinize mathematics, and mathematics teaching and learning (Fennema & Nelson, 1997; Schifter & Fosnot, 1993; Tzur, Simon, Heinz & Kiznel, 2001).

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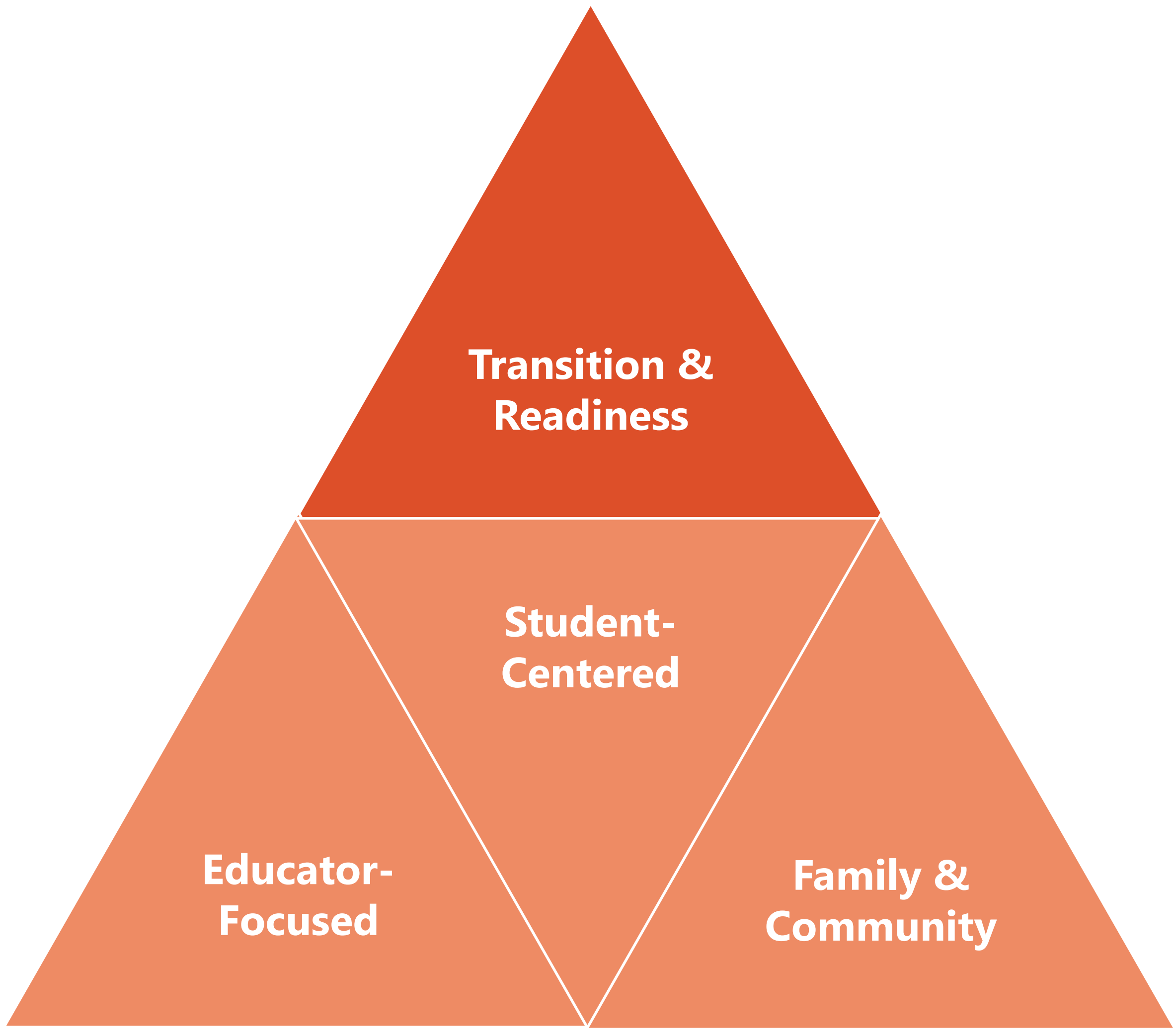
TRANSITION AND READINESS PRACTICES AND STRATEGIES



Credit Retrieval and Mastery of High School Standards

Credit retrieval for students who have not yet met graduation requirements is a promising practice. Students may be at-risk of not graduating because of not earning credit in courses due to unsatisfactory grades and/or insufficient attendance. Other students graduate, but then need to immediately enroll in remedial community college courses before starting regular freshman level work.

LAP funding can be allocated for these programs targeting 11th- and 12th- grade students at-risk of not graduating or meeting state standards on the high school assessments. It is important that these specialized mathematics programs provide innovative structures that are rigorous (targeting procedural fluency, conceptual understanding and application), develop a growth mindset, and focus on college and career readiness.

Credit retrieval, or credit recovery, allows students to retake these courses, stay in school, and graduate on time. Credit retrieval programs may be offered in a variety of formats and times such as online, face-to-face, and through a blended-learning approach. Credit retrieval programs allow students to retake coursework for which credit was not earned.

Note: OSPI does not establish the criteria for 11th- and 12th- grade students in Washington state. Districts set this policy (e.g. by age of student or by student credit accumulation). The OSPI CEDARS manual for data reporting lists age as a suggestion for determining grade-level, with age 16 as of August 31 for 11th grade and age 17 as of August 31 for 12th grade. It is recommended that eligibility for LAP credit retrieval be based on age.

Practice Possibilities—Ideas to Consider When Planning

- Offer alternative sections of coursework before or after school. Use LAP funds to support during, after, and/or summer school programs for mathematics credit retrieval. Avoid pulling students out of other activities or classes to focus on credit retrieval. This has the potential to demotivate students.
- Embed growth mindset practices along with mathematical content in all math courses. Include families and other educators/paraeducators in understanding and promoting growth mindset.
- Online courses or hybrid courses that are designed to be individualized and self-paced should not be left up to the student to complete without support, but designed to provide students’ support from a mathematics teacher well versed in the Mathematics K–12 Learning Standards who can effectively coach and motivate students. Be explicit with students about developing effective study skills and self-management strategies when engaging in online courses.

- Provide project-based courses or Career and Technical Education-equivalent courses for students to engage in an application-based learning environment.
- Offer a 4th-year transition course to support 12th- grade students who have not yet met standard on the assessments, but do intend to enroll in post-secondary coursework after high school. Transition courses provide an opportunity for students to focus on the mathematics they will need to be successful in credit bearing courses in college. For successful post-high school transitions, courses may include *Bridge to College* or *Advancement Via Individual Determination* (*AVID*).

Demographic Considerations—Student Factors to Consider When Planning

- Services are for 11th- and 12th- grade mathematics students.
- Students in the process of adjudication could benefit from additional education opportunities, such as skill centers, while they transition into their regular high school setting.
- Students already experiencing transition as a result of homelessness, military relocation, medical treatment, or foster care placement may require a variety of additional support services as they transition into or out of high school.
- Students learning English as an additional language may need math support to meet graduation requirements. Credit retrieval courses should be designed to provide differentiated support. For example, EL supports may include use of visuals or a focus on vocabulary instruction.
- High school migrant students may benefit from opportunities to access credit retrieval, tutorial support, and additional time to submit assignments.

Strategies for Implementation—Success Factors to Consider When Planning

- Identify students in 9th- and 10th- grade at-risk of not graduating on time. While LAP funding for credit retrieval is restricted to 11th- and 12th- grade students, early identification and intervention is more successful.
- Allow for flexible enrollment in credit retrieval programs, thinking beyond the traditional schedule.
- Include counseling and student support teams to provide communication and monitoring to help regulate student progress.
- Provide rigorous learning experiences. Design the program to ensure student progress toward understanding the mathematics standards rather than meeting seat-time requirements.

- Target individualized instruction only to needed areas of remediation to avoid repeating mastered elements. Use formative and diagnostic assessments to customize coursework.

Resources—Tools for Planning

- OSPI: Alternative Learning Department (ALD), Open Educational Resources, CTE Credit Equivalency Courses, and Bridge to College Transition Courses
- REL: Self-Study Guide for Implementing High School Intervention
- Advancement Via Individual Determination (AVID)
- Institute of Educational Sciences: Helping Students Navigate the Path to College: What High Schools Can Do
- theWashBoard.org
- College Spark Washington grant opportunities

Supporting Research

Credit retrieval, or credit recovery, is a LAP allowable service. Credit retrieval refers to alternative ways for 11th- and 12th- grade students to earn high school credit toward graduation after a student has completed a course and not earned credit on the initial attempt. Credit retrieval is a promising practice because it provides a time during and outside of school for additional learning opportunities (D'Agustino, 2013). These opportunities may better suit students who struggle with regular attendance, essential mathematics skill deficits, need additional time and support to complete mathematics coursework, or are disconnected from school. Credit retrieval programs are often used to keep students in school and on track for graduation (Watson and Gemin, 2008).

Credit retrieval programs may be designed in a variety of formats.

- One possible credit retrieval format is to implement an online program. Online credit retrieval programs may allow for greater rates of credit retrieval (Hughes, Zhou, & Petscher, 2015), but also pose challenges for some learners. Franco and Patel (2011) note that self-regulative strategies are key traits for learner success in these programs. Online components of credit retrieval programs can offer benefits to students who have not yet met standard by providing extra student support and contact time while developing 21st century skills (Gemin & Watson, 2009).
- Another possible credit retrieval format is to present material via alternative whole-class instruction. Here the design often differs from the classroom design where the student previously did not earn credit. Some design challenges which have been implemented with an attention to increasing student credit retrieval success are providing smaller class sizes, different curriculum (than what was previously taught), and essential skills

development. The use of different instructional material that is more appropriate for the target population provides students a second chance to engage with the content and improve their chances for achieving success. By using pre- and post-assessments to measure growth and attainment of the relevant standards, both students and teachers can feel more confident that essential skills are being developed. Students who have not yet met standard benefit from smaller class sizes as they receive more individualized attention from the teacher and support in areas of skill deficit (Malloy et al, 2010).

- Not surprisingly, some educators have blended online and traditional classroom instruction with some success. It stands to reason that if some credit retrieval students have not yet met standard because they lack regulatory controls, then having a highly qualified educator available to develop and implement instruction (as well as offer individual tutoring) would increase student success. As Watson and Gemin (2008) have explained, "The blended approach is important because it provides expanded student support and face-to-face contact. The online component—whether fully online or blended—provides 21st century skills to a group of students who often have less than average exposure to computers and technology" (p. 15).
- A fourth possible credit retrieval format is to implement a project-based learning approach. True project-based learning has five components including projects that 1) "are central, not peripheral to the curriculum," 2) "are focused on questions or problems that "drive" students to encounter," 3) "involve students in a constructive investigation," 4) "are student-driven to some significant degree," and "are realistic, not school-like" (Thomas, March 2000). In a study of two British schools (Boaler, 1998), one school described as "traditional" in its "teacher-directed, didactic" instruction and the other school described as "project-based" in its student-directed, "open-ended project" instruction, "students at the project-based school performed as well as or better than students at the traditional school on items that required rote knowledge of mathematical concepts." Also of significance "[s]tudents at the project-based school outperformed students at the traditional school on the conceptual questions as well as on a number of applied (conceptual) problems developed" (Thomas, March 2000).

According to 2016 data published by the Education Research & Data Center (ERDC) in the High School Feedback Report, 41 percent of Washington state high school graduates enrolling in 2-year and 10 percent enrolling in 4-year post-secondary institutions had to take some level of pre-college remedial coursework. Students assigned to remedial courses are less likely to earn their post-secondary degree or credential (Vandal, 2010). High school transition courses provide opportunities for high school students to deepen their mathematical understanding of concepts and skills to support success in credit bearing math courses and avoid having to take remediation courses. These courses have their best success when targeted towards students who intend to pursue college and are close to, but have not, quite demonstrated mastery of high school mathematics proficiency on assessments. Professional learning for the participating high school faculty on the specific transition curriculum is another key factor for success (Barnett, 2016).

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Grade 8 to High School Transitions

Grade 8 transition readiness is a promising practice. Mathematics transition readiness opportunities refer to programs intended to support successful mathematics transitions from 8th grade to high school. Students identified for support might benefit from one or more of the following: motivation, self-efficacy, fluency with numbers and operations, mathematical reasoning, the ability to transfer knowledge to higher levels of mathematics, and/or communication skills. For the purpose of LAP, high school transition programs begin in the 8th grade and may continue in the summer and through 9th grade. In some cases, when over one-third of the incoming freshman students experience one or more early warning indicators (excessive absenteeism, failing a course in the first quarter, or receiving a suspension), LAP funds may be used for school-wide transition programs.

Practice Possibilities—Ideas to Consider When Planning

- Create an 8th grade student mentor system where each student is assigned a high school peer mentor. Mentor/mentee activities could be scheduled monthly, over the course of the school year, or during the summer and into 9th grade.
- Design a 9th grade transition readiness academy to support LAP-served students identified in grade 8. For example, provide intentional academic and social-emotional learning supports including team teaching, student advisories, and diagnostic assessments to monitor student progress through grade 9.
- Partner with local service groups (Kiwanis, Rotary, Lions, etc.) to establish mentoring and service learning projects.
- Design and implement a summer academy for incoming freshman. This program should introduce students to the expectations regarding academics, activities, school culture, and the habits of success needed for high school.
- Design an 8th grade course that focuses on the skills and habits of mind needed to be successful in a high school environment. For example, a program like Advancement Via Individual Determination (AVID) may be particularly effective for transition readiness. AVID's professional learning for educators focuses on cultivating a positive learning environment and instructional strategies in mathematics, literacy, writing, and speaking.
- Develop a summer bridge course allowing students to develop mathematical concepts and skills and a growth mindset in mathematics.
- Some middle schools may identify a significant portion of their students for transition services based on early warning systems or based on the experience of prior 8th graders who have transitioned to 9th grade. For example, a district would be concerned if over a third of a middle school's 8th graders, upon entering the 9th grade, were identified with

one of the following indicators: failing Algebra I in the first quarter, missing more than 10 days of school in the first quarter, or a suspension in the first quarter. In these situations, consider school-wide transition programs such as freshman academies, authentic learning experiences, and intentional integration of mathematics within other content areas.

Demographic Considerations—Student Factors to Consider When Planning

- Students and families who are recent immigrants may benefit from additional encouragement and support that is responsive to their academic, cultural, and social-emotional strengths and needs as they transition into the U.S. education system.
- Students already experiencing transition as a result of homelessness, military relocation, medical treatment, or foster care placement may require a variety of additional support services as they transition into high school.
- Students and families from American Indian/Alaska Native communities may benefit from a teaching environment that focuses on cooperation instead of competition, has Tribal cultures represented in the classroom, and utilizes culturally responsive teaching methods. In accordance with state requirements under RCW 28A.320.170, school districts should support effective implementation of the Since Time Immemorial: Tribal Sovereignty in Washington State curriculum (STI) which focuses on teaching about Tribal history, culture, and the government of Tribes whose boundaries lay within Washington state. Consistent with the legislative intent of RCW 28A.320.170, high school transitions services can be designed to "improve the experiences" American Indian/Alaska Native students have in WA schools and to ensure all students in WA are informed "about the experiences, contributions, and perspectives of their tribal neighbors, fellow citizens, and classmates" (SSB 5433, Section 1). For example, in collaboration with local Tribes, school districts may integrate expanded and improved STI curricular materials and related activities into core instruction, summer programs, and supplemental services.
- Students learning English as an additional language and their families may benefit from early support towards understanding high school graduation requirements pertaining to language acquisition and credit accrual.

Strategies for Implementation—Success Factors to Consider When Planning

- Design transition interventions with models that accelerate learning.
- Provide both content and non-content supports for students. Attention to growth mindset, motivation, and counseling can help enable learning.
- Embed specific practices like goal setting, progress monitoring, and authentic learning involving real-world, complex problems and their solutions into designed supports.

- Ensure counseling services are available for students who are struggling with the transition to high school.
- Improve communication channels between middle schools and high schools, both within the district and between neighboring school districts.

Resources—Tools for Planning

- Advancement Via Individual Determination (AVID)
- OSPI: Gear Up Washington State
- Education Northwest: A Practitioner's Guide to Implementing Early Warning Systems
- Great Schools Partnership: Ninth Grade Counts: A Three-Part Guide to Strengthening the Transition into High School Part 1, Part 2, Part 3
- Washington Student Oral Histories Project: Listening to and Learning from Disconnected Youth
- The University of Texas at Austin, Charles A. Dana Center: Academic Youth Development (AYD)
- U.S. Department of Education: Newcomer Tool Kit
- Southern Regional Education Board: Ready for High School Math
- Intensified Algebra courses to support students identified as not ready for Algebra I in 9th grade.
- Assisting Students Struggling with Mathematics: Response to Intervention for Elementary and Middle Schools

Supporting Research

Researchers emphasize that 9th grade is a critical year for students because academic performance is a strong predictor of future academic achievement and the failure rate for students in grade 9 is higher than other grade levels (Bottoms, 2008; Easton, Johnson, & Sartain, 2017). Therefore, to address 9th grade failure in a proactive manner, districts and schools should consider having a robust grade 8 transition readiness plan in place. Across grade levels, behavioral needs of students are frequently linked with deficits in academic performance which, at the high school level, can become a barrier to graduation (Bruce, Bridgeland, Fox, & Balfanz, 2011). Because students' academic and behavior needs are interrelated, schools must address a variety of academic and behavioral situations that affect student learning (McIntosh, Flannery, Sugai, Braun, & Cochane, 2008).

Students exhibiting behavioral challenges in the school setting are at increased risk for dropout, especially when they experience exclusionary discipline as a consequence for behavioral infractions (McIntosh, et al., 2008). Recent national and state reports have documented the extensive use of exclusionary discipline, which disproportionately affects students of color and has multiple negative impacts on students and their communities (Morgan, Salomon, Plotkin, & Cohen, 2014). Dropping out of high school is a process that begins well before students enter high school, and there are identifiable warning signs at least one-to-three years before students actually drop out. Research shows that identifiable early warning signs are evident up to three years prior to when a student actually drops out (McIntosh, et. al, 2008; Burrus & Roberts, 2012).

Feldman, Smith, & Waxman (2013) interviewed students who dropped out and found the majority of students follow a four-phase process including: initial disengagement, early skipping, more serious truancy, followed by actual dropping out. Early warning indicators (course failure, truancy, and discipline referrals) continue to be the best predictors of dropping out for all ages. Specific behavioral risk factors for dropout include, truancy, not completing schoolwork, suspension/expulsion, involvement with juvenile justice, substance abuse, mental health, and being victims of bullying (Dalton, Glennie, & Ingels, 2009; Smink & Reimer, 2009).

The reasons for students falling off the graduation track during their first year of high school can be attributed to social and developmental adjustments, structural and organizational changes, and increased academic rigor experienced as a result of the transition (Erickson, Peterson, & Lembeck, 2013). Dr. Robert Balfanz, a researcher at Johns Hopkins University, is one of the nation's leading experts on high school dropouts. His work suggests that behavior should be considered in addition to attendance and course performance. Districts and middle schools systematically reviewing the ABCs (Attendance, Behavior, and Course performance) can identify those at-risk of dropping out and help put them on the path to graduation. An intentional focus on the middle grades' transition program is essential due to the difficulties that students' experience with social, emotional, cognitive, and physical changes, which often exacerbate the transitional concerns (Andrews & Bishop, 2012; Balfanz, Herzog, & Iver, 2007; McIntosh, et. al 2008; Somers, Owens, & Piliowksy, 2009). Students need to be explicitly taught the skills and behaviors needed for high school success. 9th grade specific courses are a great place to house the teaching of problem-solving skills, behavior expectations, time management and organizational skills, and self-advocacy (Bottoms, 2008).

In most cases, a well-designed transition program for LAP-eligible students can be a successful intervention strategy. In instances where a school has over one-third of their 9th grade students at-risk for failure, LAP funds can be used for a school-wide transition program. School-wide transition programs have also been successful at improving student performance and decreasing drop-out rates for all students. One model, freshman academies, provides focused support for 9th-graders. The academies group students and intentionally provide academic and social supports including team teaching, student advisories, and diagnostic assessment to monitor student progress (Kennelly & Monrad, 2007).

According to a recent study, "teacher teams [core content teachers who share the same students throughout the day] are the most effective model for easing the transition to high school and preparing freshmen for success" (Habeeb, 2013 p. 20). While many schools can employ this type of model, it is important to note that others may struggle to meet the demands of incoming freshmen; therefore, whatever model used must include support that is flexible, positive, goal-oriented, efficacious, and empowering (Habeeb, 2013). Traditional remedial classes are not effective in supporting successful transitions; instead, transition interventions that effectively prepare students for high school operate on a model of accelerated learning (Herlihy, 2007). Transition interventions should address not only academic content but also increase student engagement, advance social-emotional learning, develop a growth mindset, and reward academic risk-taking.

Students identified for a transition-to-high-school program might need support with the following: motivation, self-efficacy, mathematics skills, growth mindset, and conceptual mathematical understanding. A transitional program, therefore, needs to be able to engage all students in productive ways with meaningful mathematics. The intervention should address not only mathematical content but also increase student engagement, encourage mathematical discourse, develop a growth mindset, and reward academic risk-taking.

High school transition opportunities can support readiness for high school mathematics. As a general practice, student placement in algebra prior to 9th grade should be considered carefully. Accelerating all students into high school algebra while in middle school does not increase learning but rather results in lower overall student achievement (Domina, McEachin, Penner, & Penner, 2015; Clotfelter, Ladd, & Vigdor, 2015). A transitional program needs to be able to engage all students in productive ways with meaningful mathematics. The intervention should address not only mathematical content but also increase student engagement, encourage mathematical discourse, develop a growth mindset, and reward academic risk-taking.

Whatever strategies schools choose to support incoming 9th-grade students should be rooted in results—reduced failure rates, improved achievement, and increased graduation rates. If schools are dedicated to designing and implementing successful transition programs, the outcomes will be visible in the statistics, and more importantly, in the attitudes, motivations, and accomplishments of the students.

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Kindergarten Transitions

Supporting kindergarten transitions is a promising practice. Transitioning through kindergarten is a time when behavioral, emotional, and social changes impact all students and their families. Communities, schools, families, and educators can increase the likelihood of a successful student transition by providing academic and non-academic support services. Kindergarten transition opportunities provide support to students and their families for successful transitions from in-home care, daycare, relative care, pre-school, ECEAP, or Head Start.

LAP funds may support transition to kindergarten through a number of different strategies as provided in the menus of best practices. Districts are encouraged to set up data-sharing opportunities with early learning providers and families to be able to identify the children who may need additional transition support prior to the start of the kindergarten year.

Note: Washington state statute starts LAP eligibility at kindergarten. As such, kindergarten transition strategies funded with LAP should start after a child has enrolled in kindergarten. They may start prior to the first day of school. LAP allowable funding options for children enrolled in kindergarten, and identified as needing extra support, may include:

- In late spring/summer, educators can conduct family engagement and home visits.
- During the summer, before kindergarten starts, educators can provide transitions programs.

LAP funds could be used throughout the year for professional learning time between early learning providers (preschool and childcare) and kindergarten teachers to focus on strategies to improve the academic readiness of students arriving at kindergarten. LAP funds for this professional development should be focused on foundational early skills alignment (social emotional, numeracy, and literacy) focused on the providers serving students most in need of kindergarten transition support. WaKIDS data is a great resource for districts to use to identify students for services and content for instruction and professional learning.

Practice Possibilities—Ideas to Consider When Planning

- Establish a program that allows pre-kindergarten and kindergarten educators to create a transition plan with a focus on sharing student data, aligning curriculum, and supporting strategies for transitioning students.

- Create an outreach program that promotes early kindergarten registration, conducts needs assessments with families, finds and connects families with resources, and provides a safety net of support for the first several months a child attends kindergarten.

- Provide opportunities for families to visit elementary schools before children begin kindergarten by inviting students and families to participate in school events, school tours, school lunch, library time, and recess.
- Provide opportunities for teachers to share WaKIDS results with parents and provide activities parents can engage in with their children to support areas of need as identified by the WaKIDS assessment.
- Develop summer transition programs, or kindergarten camps, that focus on incoming kindergarteners who may not have attended a pre-school program. Allow time for kindergarten students to become familiar with teachers, buildings, classrooms, and routines.
- Cultivate a peer connection program that arranges for pre-school children and kindergarten children to meet, play, and connect within a classroom or outside the classroom at a community event.

Demographic Considerations—Student Factors to Consider When Planning

- Students and families who are new to the school system benefit from a friendly environment where families are valued as decision-makers regarding their own child's education and school programs.
- Migratory families may benefit from programs that help students learn about school routines and ease the separation from home to school; families benefit from learning about activities and strategies families can do in the home to strengthen their child's education in the classroom.
- Students and families from American Indian/Alaska Native communities may benefit from a teaching environment that focuses on cooperation instead of competition, has Tribal cultures represented in the classroom, and utilizes culturally responsive teaching methods.
- Students and families who are learning English as an additional language benefit from a welcoming environment where responsive two-way communication, in the language spoken by the family, is facilitated.
- Students and families who qualify for free- and reduced-priced lunch benefit when they are connected to resources and information related to family services.
- Students and families who participate in Head Start or ECEAP programs benefit when standards, curriculum, support services, and assessments from pre-kindergarten to kindergarten are carefully aligned.

- Students who struggle with emotional and/or social issues that may hinder a successful transition benefit from peer connections that continue from pre-school into kindergarten.

Strategies for Implementation—Success Factors to Consider When Planning

- Establish protocols for collecting data from pre-kindergarten programs to support early intervention.
- Promote academic readiness and emerging literacy, language, numeracy, and social emotional skills families can practice at home. WaKIDS data can help inform these practices.
- Provide families tools and support to be advocates for their children.
- Provide funds to purchase support materials for age-level readiness practices.
- Provide time and funding for collaboration between pre-kindergarten and kindergarten staff, families, and community members to establish a district-wide transition plan for students entering kindergarten.
- Provide time and funding for pre-school and kindergarten teachers to collaborate.
- Provide time and resources to promote ongoing connections among children, families, in-home, daycare, and pre-kindergarten providers with elementary schools.
- Identify a coordinator to oversee kindergarten transition programs, connect with families/early childhood centers, and monitor progress.
- Provide training for kindergarten educators to further develop an understanding of the norms, practices, and procedures of pre-school education.
- Provide training for educators on culturally sensitive and anti-bias pedagogy, curriculum, early childhood development and evidence-based practices.
- Provide services tailored to the cultural, linguistic, and learning needs of students and their families.

Resources—Tools for Planning

- Institute for Educational Leadership: Case Studies of Early Childhood Education & Family Engagement in Community Schools
- ChildCare Aware of Washington: Collaboration with Principals and Child Care Providers
- Washington State Early Learning and Development Guidelines Birth Through Third Grade
- Kindergarten Questionnaires and Checklists: Bellingham Public Schools- Kindergarten Parent Questionnaire and Teacher Questionnaire; Washington State Department of Early Learning Kindergarten Checklist

- Eriikson Institute: Programs and Services
- Coalition for Community Schools: The Early Childhood Community School Linkages Project
- OSPI: Washington State Full-Day Kindergarten Guide, Early Literacy Pathways, Early Numeracy Pathways, and WaKIDS
- University of Washington's Institute for Learning & Brain Sciences: Love, Talk, Play
- Enhancing the Transition to Kindergarten: Linking Children, Families, and Schools
- Center on the Social and Emotional Foundations for Early Learning
- National Center for Pyramid Model Innovations

Supporting Research

Kindergarten transition is a crucial time for young students and families. Transition programs can set the stage for how families will handle their children's future educational experiences by engaging them in the transition to kindergarten. Kindergarten students in particular need of additional support and care when transitioning as changing learning environments present new challenges: new academic expectations, different school structures, and new social interactions with peers and adults. Families, educators, and community partners can use effective transition activities to create supports and connections across pre-kindergarten and kindergarten settings. (LoCasale-Crouch et al., 2008). These practices should begin prior to kindergarten and take into account the cultural, linguistic, and learning needs of individual students and their families (National Center on Parent, Family, and Community Engagement, 2013).

Key guiding principles should be in place as a framework for kindergarten transition success (Sayre & Pianta, 2000, p. 2):

- Foster collaborative relationship building among educators, families, and students.
- Promote continuity between pre-school and kindergarten systems.
- Focus on family strengths to develop school support.
- Focus on the individual needs of the student.

Building capacity for students, families, and schools is essential. Children's successful transition to kindergarten relies upon building relationships with a variety of people, including families, day care providers, pre-school educators, and elementary educators (La Paro, Kraft-Sayre, & Pianta, 2003). Family connections, whole child assessment, and early learning collaboration are key components of the Washington Kindergarten Inventory of Developing Skills (WaKIDS). Research supports using these three components as the foundation for best practices in successful kindergarten transitions.

Transition to kindergarten activities need to establish effective communication between pre-school/pre-kindergarten settings and elementary schools (La Paro, Kraft-Sayre, & Pianta, 2003, Sullivan-Dudzic, Gearns, & Leavell, 2010). Fostering collaborative relationships, and two-way communication, among stakeholders supports successful and seamless transitions for students. The culture in an elementary school may be more formal than the typical culture of a pre-school (Connors & Epstein, 1995; Pianta & Kraft-Sayre, 1999), which makes communication between the two settings more crucial to help students and families navigate the new environment. "These environments should also work together to ensure that standards, curriculum, support services, and assessments from pre-kindergarten settings to kindergarten are carefully aligned" (Bohan-Baker & Little, 2002; Kagan & Neuman, 1998; Pianta & Kraft-Sayre, 2003, Sullivan-Dudzic, Gearns, & Leavell, 2010).

Communication with Families

Kindergarten transition plans that promote family participation prior to the start of the school year have been associated with students having increased self-confidence, school enjoyment, and overall happiness with the kindergarten experience (Hubbell, Plantz, Condelli, & Barrett, 1987). Transition to kindergarten should include opportunities for students and families to learn about the new setting, build relationships, and experience continuity in curriculum and assessments within their new setting. Children show greater school readiness (Hubbell et al., 1987; LoCasale-Crouch, Mashburn, Downer, & Pianta, 2008), reduced stress at the beginning of school (Hubbell et al., 1987), and stronger academic growth over their kindergarten year (Ahtola et al., 2011; Schulting, Malone, & Dodge, 2005) when such opportunities are offered.

Outreach to families should be done in a personal way before students enter kindergarten (Pianta et al., 1999; Sullivan-Dudzic, Gearns, & Leavell, 2010). Families are more likely to be involved in their student's kindergarten year when schools actively engage families in the transition process and recognize the families' efforts to participate (Schulting et al., 2005). Outreach with families that is established in pre-kindergarten programs promotes positive relationships and emphasizes early on that families are valued partners in their child(ren)'s education (La Paro, Kraft-Sayre, & Pianta, 2003). Schools and educators can smooth the transition to kindergarten by engaging families in meaningful ways. Families gain confidence from helping their children adjust to new schools. (Van Voorhis et all, 2013, p. 117). One way to support early family engagement is to establish family visits between kindergarten educators and school staff prior to the beginning of the school.

Research by La Paro, Kraft-Sayre, & Pianta (2003) showed that despite barriers families may face, when offered opportunities to interact with the transition process, such as meeting with educators prior to the beginning of the school year and visiting kindergarten classrooms, families almost always participated and believed that these opportunities were helpful. When asked, families can offer educators knowledge about their children to support classroom routines and can help reinforce essential academic and non-academic skills at home (Ferretti & Bub, 2017; Sullivan-Dudzic, Gearns, & Leavell, 2010). Students who experience more stability in their early school settings, and in the relationships with the adults in these settings, perform better socially and academically (Curby, Rimm-Kaufman, & Ponitz, 2009; Tran & Winsler, 2011) during their kindergarten year and beyond.

Regardless of a student's skill level, positive relationships between schools and families support children's academic progress (Kraft-Sayre & Pianta, 2000). Establishing relationships with community partners, pre-kindergarten learning partners, and kindergarten educators may help provide resources to and support for students and families during the kindergarten transition. "Peer connections that continue from children's pre-school years into kindergarten also can help ease children's transition to school by being a source of familiarity and an avenue for building social competencies" (Kraft-Sayre & Pianta, 2000). These types of adult and peer relationships support social and emotional competencies in young students that aid in their school success (Kraft-Sayre & Pianta, 2000).

Community Partnerships

Pre-school and kindergarten programs can make the transition for families smoother by aligning pre-school and kindergarten policies and practices (Sullivan-Dudzic, Gearns, & Leavell, 2010; NCDEL, 2002). "Connecting early childhood programs with the K–12 educational system is a proactive strategic plan to increase student achievement" (Sullivan-Dudzic, Gearns, & Leavell, 2010, p. 1). Consider including the following stakeholders as part of the district kindergarten transition team (Sullivan-Dudzic, Gearns, & Leavell, 2010):

- Elementary school principals
- Kindergarten and local pre-school educators
- Families (include multiple demographics and include pre-school and private school families)
- School board members
- Child care providers
- Higher-education professionals
- District leadership (e.g. Title I director, special programs coordinator, etc.)
- School district PTA/PTO president
- Other community organization representatives (e.g. Tribal leaders, Head Start supervisor, healthcare providers, etc.)

By inviting multiple partners to be part of the planning and implementation of kindergarten transition practices, districts can focus on "increasing achievement, by using a unified approach that honors existing efforts and builds on the strengths and resources in your community" (Sullivan-Dudzic, Gearns, & Leavell, 2010, p. 27).

It is also important for pre-kindergarten and kindergarten educators to participate in ongoing professional learning opportunities together to support social emotional and academic competencies necessary for school success and achievement (NCDEL, 2002). Promoting professional learning on culturally sensitive and anti-bias pedagogy, curriculum, early child development, and evidence-based practices ensures that educators receive the supports needed to fully engage students and families both academically and non-academically (Henderson and Berla, 1994; Epstein 2001; Weiss, Caspe, & Lopez, 2006; Halgunseth, 2009).

Student Success

"Teachers report that nearly half of typically developing children experience some degree of difficulty during the transition to kindergarten" (Ferretti & Bub, 2017; Rimm-Kaufman & Pianta, 2000, Rimm-Kaufman, et al., 2000). In any classroom, there are students achieving beyond the grade-level standards and students not yet achieving the grade-level standards. The goal is for all students to meet the end-of-year expectations, and when necessary, to recognize that stages of development are based on experiences and not solely defined by age or grade. It is essential to take into consideration the learning progressions necessary for student growth by planning intentional experiences, selecting appropriate materials, and determining the best instructional approaches to meet students' academic and non-academic learning needs. In order for the unique learning needs of students to be met, educators must understand the social-emotional, language, literacy, and numeracy needs of each student.

Educators and researchers recognize that social-emotional competencies and skills related to school preparedness develop early in life. A recent study reports that children who enter kindergarten with underdeveloped social-behavioral skills are more likely to be identified for special education services, suspended or expelled from school, and retained to repeat grade-level standards (Bettencourt, Gross, & Ho, 2016). While focusing on social-emotional development in early childhood is critical, social-emotional learning (SEL) can take place throughout a student's primary and secondary education. Research indicates that SEL programs can positively influence a variety of student educational outcomes across grade levels (Durlak, et al., 2011).

High-quality instruction in language and literacy skills is vital to students' academic and non-academic success. Children start developing language and literacy skills at birth; *emergent reading* skills and *early reading* skills start around age three (Early Literacy Pathways, 2016). Oral language skill development helps students as they begin to develop and progress reading and writing skills. As students enter kindergarten, oral language skills are connected to later gaps in both reading and writing (Coll, 2005; Storch & Whitehurst, 2002). English language development for students learning an additional language is also grounded in oral language skill development and needs explicit instruction; by providing instruction in oral language development in a student's native language, educators can build a foundation for literacy and a bridge for the student's English literacy development (Beeman & Urow, 2013). For additional information, research, and best practices on oral language, alphabet knowledge, and phonological awareness refer to ELA Menu: Appendix A.

Mastery of early math concepts (number sense and counting) upon school entry is the strongest predictor of future academic success (Duncan, 2007). Learning to make sense of mathematics early helps build future math proficiency. Students transitioning to kindergarten should have opportunities to make sense of math ideas including number concepts and quantities, number relationships and operations, geometry and spatial sense, patterns, and measurement and comparison. For more information on math progressions for early learners, refer to Learning Pathways in Numeracy. An important success factor, and an important tie-in to early literacy, is to get children to communicate their ideas and explain their thinking about mathematics in their natural language. By providing opportunities for students to share their thinking, educators can assess what concepts students understand, and they can identify gaps in students' mathematical understanding.

Families, pre-kindergarten, and kindergarten programs can provide opportunities to develop social-emotional learning, language, literacy, and numeracy skills through play, songs, books, games, and other daily routines. For more information on social-emotional learning, early literacy, and early numeracy, please refer to the background and philosophy sections in the menus of best practices and strategies.

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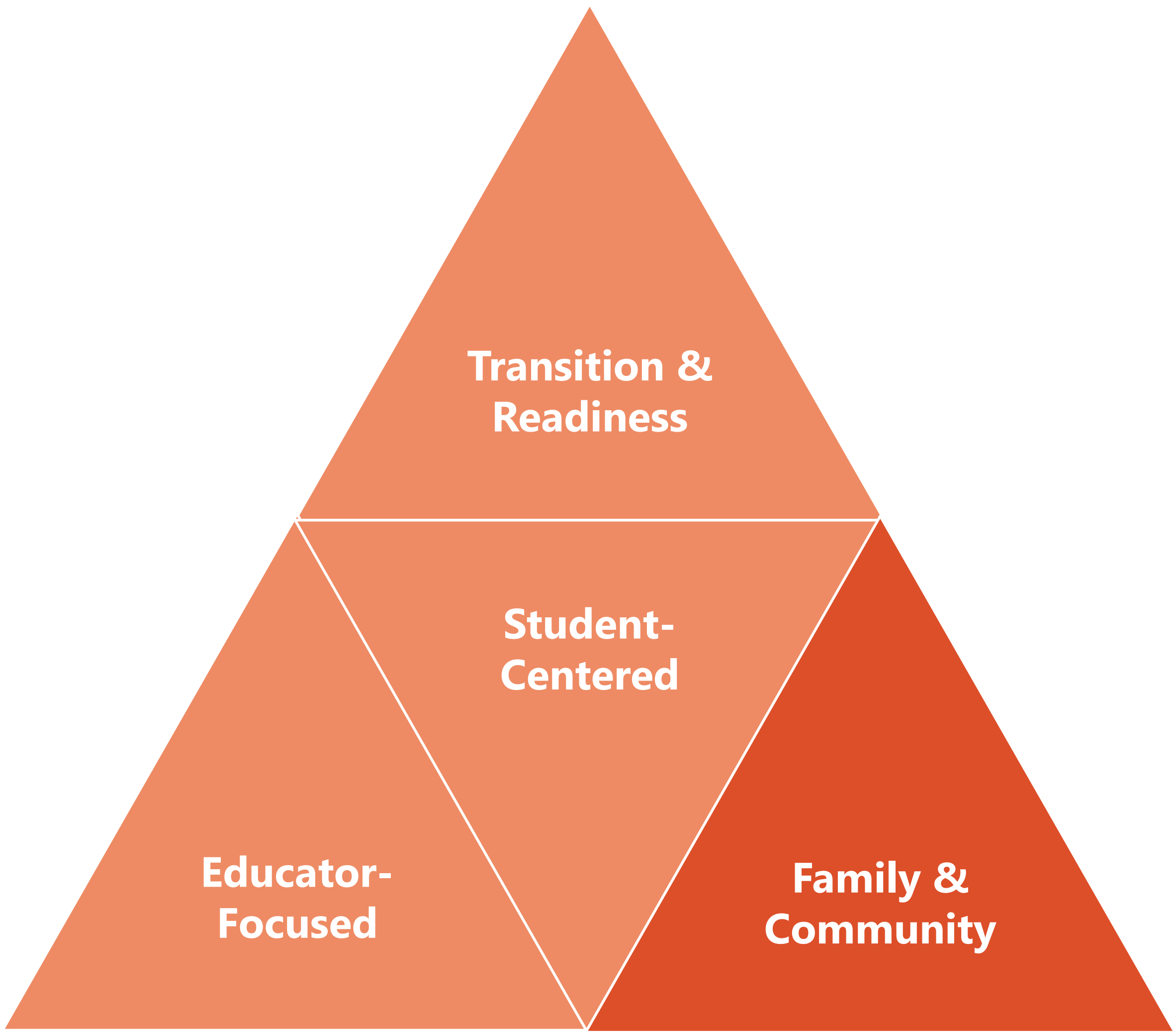
FAMILY AND COMMUNITY PRACTICES AND STRATEGIES



Family Engagement

Family engagement is a promising practice. Family engagement involves two-way communication in which families and educators come together as equal partners to engage in decision-making processes. Family engagement with mathematics, beginning in the early years and continuing throughout a student's schooling, greatly influences the student's mathematical understanding and positive feelings about mathematics, among other aspects of education. Family engagement has numerous benefits to the student, including his or her mathematical efficacy. By deepening our awareness of students' informal experiences with math in their homes and cultures, educators can foster strong connections with math ideas encountered at school.

Family engagement involves collaboration between families and schools toward increasing student success. Family engagement can occur during the school day (within the school building or outside of school), within families' homes, or within the community. LAP funding may support family engagement programs to improve the academic outcomes of participating students**.** The following menu entry provides a robust list of research-based practices and possibilities, including family engagement coordinators and modeling instructional strategies families can provide at home.

Practice Possibilities—Ideas to Consider When Planning

- Create a culturally responsive family leadership program and invite families to join the school-improvement planning process. To ensure joint decision-making, ask families to make recommendations to support and promote family engagement practices.
- Provide a space within the school where educational staff can support families and students in mathematics. This space could be available for families to convene before, during, and after school. For example, invite families to participate in number talks in the library after school.
- Create a plan to host monthly family mathematics events. These events should have targeted mathematics goals and provide time for families to practice mathematical skill building. When possible, provide tips/materials for families to continue practicing the mathematics strategies learned at the event at home.
- Create mathematics games for students to play at home. Families can support development of mathematical ideas by playing the games.
- Establish a home visit program where educators engage families. Family preference should determine if visitations occur in the home or at another mutually agreeable location. Home visits present educators with opportunities to develop authentic and meaningful relationships with families.

- Provide educators with professional learning opportunities on the effective use of funds of knowledge. Funds of knowledge are the knowledge and skills a student learns from their family and cultural background. Apply this learning when designing school policies, mathematics instruction, family engagement activities, and volunteer opportunities.
- Use technology to support positive ongoing communication with families. Take a photo with each student on the first day of school and share it with the family. Continue to send positive visual updates bi-weekly/monthly on students engaging in mathematics activities. Use screen captures or SmartBoard captures to record students solving a math problem. Send this to families asking the student to share the solution.

Demographic Considerations—Student Factors to Consider When Planning

- Students without immediate family members in their lives, such as students experiencing homelessness or students in transitional situations, should be welcome to participate in family engagement activities and be encouraged to invite friends or other persons they consider family.
- Families with adverse experiences in schools may require prolonged and intentional positive feedback from school staff before the family will engage in regular, meaningful communication with the school.
- Students with negative feelings about mathematics benefit from seeing family members and other trusted adults engaging in mathematics and expressing positive attitudes about mathematics.
- Family mathematics support results in students being more likely to complete high school and go on to college.
- Family engagement in schools starts to decrease as early as grade 3.
- Families who are learning English as an additional language benefit from personal invitations, translation and interpretation services, and guided support.
- Migratory families benefit from information about the school, community, and services their children could receive as they may be new to the area and unsure how to access resources.
- Students and families from American Indian/Alaska Native communities may benefit from Title VI—Indian Education funded support services.
- Students and families from American Indian/Alaska Native communities may benefit by participating in extra-curricular Tribally sponsored events like read-arounds, pow wows, culture nights, youth leadership programs, Tribal Journeys/canoe families, etc.

Strategies for Implementation—Success Factors to Consider When Planning

- Welcome all families. Create a family friendly school learning community that is inviting and authentic.
- Focus on getting to know students and families during home visits.
- Communicate positively about mathematics with a belief that all students are mathematicians by promoting a learning environment in which mistakes are expected, celebrated, respected, and used as learning opportunities.
- Consider ways to provide workshop and family night information to those who could not attend: podcasts, online videos, and other formats aligned with parent resources at home.
- Advertise events through multiple modalities: personal invitations in the family's home language, emails, social media, phone messages, and postcards.
- Establish a positive relationship with families during the first few weeks of school by making phone calls and using authentic outreach efforts.
- Hire a family/community liaison to explicitly connect and communicate with families about the resources available within the community.
- Design support for families around mathematical skills, homework, student progress-monitoring, and conversations about school and learning.
- Communicate using the family's home language when sharing information about events, expectations, and available resources and materials.
- Give families timely notice and schedule flexible meeting times that would allow families with irregular working schedules more opportunities to participate.
- Identify families where English is not the home language and provide interpreters at events to support these families.
- Design activities and games for students to take home and play with their families.

Resources—Tools for Planning

- Harvard: Global Family Research Project, A Dual Capacity-Building Framework for Family-School Partnerships, and HarvardX – Introduction to Family Engagement in Education
- National Network of Partnership Schools: Dr. Joyce Epstein, Six Types of Involvement: Keys to Successful Partnerships and PTA National Standards for Family-School Partnerships Assessment
- OSPI: WA State Title I, Part A website, Funds of Knowledge and Home Visits Toolkit

- REL: Toolkit of Resources for Engaging Families and the Community as Partners in Education Part 1, Part 2, Part 3, Part 4
- National Association for the Education of Young Children: Engaging Diverse Families
- Washington State Family and Community Engagement Trust
- High Expectations

Supporting Research

Families can and do make a difference in the academic and social-emotional lives of students. School-based family engagement efforts can have a positive impact on K–12 student academic achievement (Jeynes, 2012). However, effective family engagement practices ultimately support improved student academic and non-academic outcomes (Caspe & Lopez, 2006). "When schools build partnerships with families that respond to their concerns and honor their contributions, they are successful in sustaining connections that are aimed at improving student achievement" (Henderson & Mapp, 2002, p. 8).

Family engagement strategies are built on the foundation that:

- All families have goals and dreams for their children
- All families have the capacity to support a child's mathematics outcomes
- All families and educators are equal partners
- Educational leaders are responsible for engaging in partnerships (Henderson, Mapp, Johnson, & Davies, 2007)

The Washington State Governor's Office of the Education Ombuds (OEO) recommends developing and sustaining meaningful, culturally responsive school and family partnerships. The OEO Family and Community Engagement Recommendations (2016) highlights the importance of genuine, authentic relationships between diverse groups of families, educators, and community members to support student success in schools.

Family and community *engagement* strategies are more inclusive than *involvement* strategies. Consider the following (Mapp & Kuttner, 2013):

- Involvement means to include as a necessary condition. Involvement strategies tend to coincide with meeting requirements and lack a true partnership. Family and community involvement strategies often result in **one-directional communication**. This looks and feels like educators passing on information to families.

- Engagement means to pledge or to make an agreement. Engagement strategies work to develop relationships and to build trust. Family and community engagement strategies ignite **two-way communication** and bring families and educators together as equal partners in the decision-making processes. This looks and feels like teamwork.

Communication with families is vital to promote collaboration between students' home and school settings, and provides the direct benefit of increased student achievement. However, barriers can and do exist that limit effective communication with families. Schools need to consider socio-economic conditions, cultural and linguistic factors, disability-related needs, and other family characteristics when strategizing how to overcome barriers to effective communication and collaboration with families (Drummond & Stipek, 2004; Cheatham & Santos, 2011; Tucker & Schwartz, 2013). Schools should make a considerable effort to promote collaboration by using multiple means of communication (Graham-Clay, 2005; Cheatham & Santos, 2011). Often families only receive communication from the school when their child has done something wrong. The perspectives of families with a history of negative interactions with the school can inform communications plans if their input is valued (Tucker & Schwartz, 2013). Effective two-way communication with families can be implemented in a variety of ways to strengthen collaboration between school and home.

It is important to have a well-organized family engagement plan around partnership with families (Epstein & Salinas, 2004). Family and community engagement can include a variety of activities and events. When planning family and community activities/events, it is important to include and invite families and community members in all aspects of planning and implementation stages (OEO, 2016). Joint decision-making and responsibility are key components to successful partnerships. When planning events, it is also important to have targeted learning goals and time for participants to practice and receive feedback on the desired outcomes. For example, the learning goal of a mathematics event may be to provide families with shared strategies to support counting and cardinality activities at home. This event would be designed to provide strategies, examples of the strategy in use, and time for family and community participants to practice and receive feedback on implementing these strategies (Mapp & Kuttner, 2013).

Home visits can be beneficial for all students K–12, especially for new-comers to a district and for those transitioning into a new building. These meetings can occur before the school year begins, and they can take place in the student's home or at an agreed-upon location in the community. As families and educators meet for the first time, these conversations should not be an overload of information based on expectations and rules. Instead, these meetings should be conversational and focused solely on the child. One question educators can ask families to start these conversations would be: "What are your hopes and dreams for your child?" It is important for families and educators to build a foundation of trust and respect.

One example of home visits could occur at the beginning of the school year when kindergarten teachers meet with families and early learning providers to talk about each child's strengths and needs. The Washington Kindergarten Inventory of Developing Skills, or WaKIDS, brings families, educators, and early learning providers together to support each child's learning and transition into public schools. These meetings are beneficial to students, families, and educators and can take place in neutral locations. They can also increase student attendance and family participation in additional school activities and events (Mapp & Kuttner, 2013).

When parents engage with their children in mathematics-related activities, it positively affects their mathematics achievement. Specifically, there are positive effects when parents actively support their children's mathematical development at home. Among other things, parents can be supportive by playing mathematics-related games with their children at an early age, providing real-life experiences that involve mathematics (money, shopping, cooking, pointing out the use of numbers in signs, etc.), assisting with homework, and by expressing positive attitudes toward the learning of mathematics. Family engagement strategies involving learning activities at home are more likely to have a positive effect on both student achievement and social-emotional development (Voorhis, Maier, Epstein, & Lloyd, 2013).

As with reading, an early positive start in mathematics helps students obtain and maintain grade-level understanding of the mathematics taught. For this reason, parent engagement in numeracy activities is critically important in the young years. In a meta-analysis of six longitudinal data sets, Duncan et al. (2007) found that kindergarten entry-level numeracy skills have the greatest predictive power of later mathematics achievement. This would indicate that parental engagement with their children in numeracy games and activities is significant for their later achievement. Examples of more complex activities would involve thinking about strategies to work with number operations and comparing numbers rather than just learning the counting sequence or counting objects.

Studies show similar support for parent engagement at higher grades. Cai, Moyer, and Wang (1997) found that middle school students with more supportive parents demonstrated higher mathematics achievement and more positive attitudes toward mathematics than those parents who have minimal engagement with supporting mathematics. Particularly with this age group, parents who serve as motivators, resource providers, and monitors occupied roles that were the most important predictors of students' mathematics achievement.

Research supports the notion that family engagement opportunities need to specifically increase family awareness of mathematics learning. Research suggests that a parent's feelings of efficacy in a particular content area are tied to his or her level of involvement (Hoover-Dempsey, Bassler, & Brissie, 1992). Parents report engaging with their children more often in English language arts than in mathematics due to their sense of efficacy in these subjects (Epstein, 2005). Schools should, therefore, partner with families to support parents' sense of efficacy in mathematics as a strategy to support students' learning of mathematics. Well-designed family engagement programs "should be ongoing, culturally relevant, responsive to the community, and target both families and school staff" (O'Donnell & Kirkner, 2014).

As schools/districts review student outcome data, it is important to include families and community members that represent the diversity of the school. Team members should represent the demographic needs of all students. Data-based decision-making and goal setting improve when educators and community members work together. One suggestion is to have an action team for partnerships (Epstein & Salinas, 2004). An action team should consist of teachers, administrators, parents, and community partners, and be proactively connected to the school council or school improvement team. The focus of the partnership is to promote student success, develop the annual plans for family engagement, evaluate family engagement, and develop activities to include all families in the school community.

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Community-Based Student Mentors

Community-based student mentoring is research-based. It is defined as a positive relationship between a non-parental adult (or older youth) to a younger child or youth. Community-based mentoring usually takes place outside the school day with longer sessions and strong mentor-mentee relationships built over time. School-based mentoring occurs during the school day with shorter sessions and mentor-mentee relationships lasting a year or more. Mentoring relationships are typically 1:1. The structure of the mentoring experience requires goal setting and may include a variety of social, cultural, and academic activities.

Community-based student mentors can support mathematical development for students who have not yet met mathematics standards. Students can benefit from relationships with community-based mathematics mentors. The mentors can help students: 1) see how mathematics are used in their professional work, 2) understand and apply the mathematical concepts they are learning in school, and 3) understand the value of persistence when their mentors show how they approach solving mathematical problems. Community partnerships funded with LAP funds must have a focus of supporting LAP-served students.

Practice Possibilities—Ideas to Consider When Planning

- Utilize existing STEM community connections to identify potential mathematics mentors.
- Tie in to various career exploration programs to help align students' interests with available mentors.
- Engage mentors to help identify interesting mathematics problems for students to address in their classes.
- Utilize services like Volunteers of America to help coordinate and source potential mentors.
- Connect with local libraries, faith-based organizations, and community youth outreach programs to find, train and use adult non-parental mentors who will then connect with identified students who would benefit from a mentor-mentee relationship.
- Partner with Boys and Girls Club and provide transportation after school to support mathematics mentoring programs.

Demographic Considerations—Student Factors to Consider When Planning

- Middle and high school students might receive the highest benefit in terms of learning how mathematics is applied in various professional careers and jobs.
- Elementary students who need support in mathematics can thrive in the context of support and encouragement from a caring, trusted adult.

- First generation college-bound students benefit from a mentor relationship not just for mathematics support, but also from learning about habits of mind, self-efficacy, and other success strategies for a college transition. Additional guidance about the process of entering college, including applying for financial aid, identifying colleges of interest, and completing college applications is also important and can help motivate students who have not yet met standard to see a path to advanced learning.
- Students who are at-risk of dropping out benefit from a relationship with a mentor who has skills and experience with at-risk students.
- Students who may need a positive adult role model (for various reasons) and are struggling to meet mathematics standards.

Strategies for Implementation—Success Factors to Consider When Planning

- Provide information to mentors about what students are learning in their mathematics classes and opportunities for the student's teacher and mentor to communicate.
- Provide professional learning opportunities to mentors to ensure they understand the Mathematics K–12 Learning Standards and how to support students in their efforts to learn mathematics. Ensure the mentors understand that mathematics success is not about speed or fast recall of facts, but rather about reasoning, conceptual understanding, and perseverance.
- Build an awareness of the importance of positive messages about mathematics.
- Use student-identified professions and interests, like biotechnology, health care, sports, industrial design, and others where mathematics is used and seek mentors in those career fields.
- Provide students with a choice of mentors to help increase engagement.
- Ensure activities are developmentally appropriate.
- Seek parent permission and involve parents in creating goals and activities.
- Provide mentors and mentees regular opportunities to meet and to participate in shared activities over an extended period of time.
- Encourage mentors and mentees to set goals and consistently revisit and adjust goals.
- Mentors and mentees need opportunities to meet and participate in shared activities on a regular basis over an extended period of time.
- Mentoring programs should carefully screen mentors, thoughtfully match mentors and mentees, and provide training for the mentors.

- Mentor programs should utilize a paid mentor coordinator who coordinates activities, communicates with families, and recruits/trains/supports mentors.

Resources—Tools for Planning

- University of Kansas Community for Health and Development: *The Community Toolbox*
- MENTOR: National Mentoring Partnership
- National Mentoring Resource Center
- Education Northwest: Institute for Youth Success, Mentor/Mentee Training and Relationship Support Resources, and Youth Mentoring Program Planning and Design Resources

Supporting Research

Mentoring is defined as a positive relationship between a non-parental adult or older youth to a younger child or youth (Gordon et al., 2009). Mentoring programs may be broadly categorized as school-based or community-based. In school-based mentoring, mentors typically meet with mentees one-on-one during or after the school day and engage in both academic and non-academic activities. Community-based mentoring occurs outside of the school context. Community-based mentoring sessions are typically longer than school-based mentoring activities, and community-based mentor-mentee relationships often are longer in duration than school-based matches (Herrera et al., 2011).

Mentoring experiences can take many forms. The structure of the mentoring experience is often influenced by the goals of the mentoring program and may include a variety of social, cultural, and academic activities. Mentors and mentees may spend time studying and going to local events, but may also spend time navigating issues for the mentee such as problems with time management, conflicts with a teacher, relationship issues, or family problems (Larose et al., 2010). The types of activities may vary based on the age and needs of the mentee. "In late adolescence activities focused on personal and professional identity, autonomy, time and relationship management, and skills development are believed to meet the needs shared by many young people. Mentoring program managers must ensure that the objectives of their programs and the nature of the activities in these programs strongly reflect the developmental needs of their clientele" (Larose et al., 2010, p. 138).

The school-based mentoring relationship can provide students with a more positive experience and outlook on school. Studies show that participation in school-based activities increases students' sense of school belonging and liking (Eccles & Barber, 1999; Grossman et al., 2002). This experience may, in turn, lead to improved attendance and academic performance. Studies have found positive associations between school-based mentoring and academic performance

(Diversi & Mecham, 2005; Hansen, 2007), self-perceptions of academic abilities (Bernstein, Dun Rappaport, Olsho, Hunt, & Levin, 2009), and attitudes toward school (Karcher, Davis, & Powell, 2002; King, Vidourek, Davis, & McClellan, 2002; Portwood & Ayers, 2005).

Both school-based and community-based mentoring have been found to have a positive effect on student academic outcomes. In a study of middle school African American students, researchers found an Afrocentric mentoring program to be effective in fostering academic achievement and success in the participating mentees (Gordon et al., 2009). In a five-month Big Brothers Big Sisters school-based mentoring program, mentees experienced modest short-term academic gains (Herrera at al., 2011).

Other important benefits include: improved self-esteem levels, better relationships with other adults, more clarity in both academics and future college and career outlook (Community Tool Box, 2016). Community mentoring programs offer innovative options for both mentor and mentees by building partnerships that may lead to valuable life skills. Mentor programs can break down stereotypes, promote teamwork, and help create a culture of community diversity.

Research shows that to build lasting and effective community mentoring programs, specific factors must be considered. Community partners must be identified and approached to determine commitment level, willingness to contribute financially, and ability to assist in finding and training mentors. Next, youth recipients of mentoring need to be approached and connected with the "best fit" mentor. This step is critical to the success of not only the mentor/mentee relationship, but also the program as a whole. These relationships take hard work, open minds, flexibility, and a promise to communicate and problem solve as a team (Community Tool Box, 2016).

Trust is the final factor when building a lasting community mentoring program. Trust among the stakeholders; trust between the mentor and mentee; and trust in the process. Young people often have trust issues with adult authorities; therefore, mentors need to be sensitive to this possibility and be willing to build the relationship slowly. Open communication, consistency, and positive encouragement are key to building trust while also promoting responsible feelings and actions.

The above elements combined with the principles of mentoring outlined in *The Elements of Effective Practice for Mentoring* will ensure a quality program that will instill confidence in the youth who are served. These principles (listed below) should be the foundation upon which any fruitful program is built.

Principle	Description
Recruitment	Recruit mentors and mentees by relaying a realistic description of the program's elements and goals.
Screening	Screen mentors and mentees to determine commitment, time and personal characteristics needed to form a lasting relationship.
Training	Training must focus on ensuring that prospective mentors, mentees, and their parents or guardians have the basic knowledge, attitudes, and skills needed to build a safe and effective relationship.
Matching	Matching helps create appropriate mentoring relationships by using strategies most likely to increase the odds that the relationship will be safe and effective.
Monitoring and Support	Monitoring and support are critical to mentoring as relationships develop and need to be adjusted to changing needs. Support may also include additional training when needed.
Closure	Closure is a normal stage in a mentoring relationship, and mentors and mentees should be able to prepare for closure and reflect upon their experience with the relationship.

These principles are the pillars of community-based mentoring programs that will impact students academically, emotionally, and socially.

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Conclusion

The math menu will be updated annually, no later than July 1 each calendar year. Interested stakeholders are invited to submit recommendations for intervention practices, along with related research references, for consideration by the expert panel for possible inclusion in subsequent menus. It is important to note that if new research emerges that disproves the effectiveness of a practice that has historically been included in this report, the practice may be removed and no longer allowed under LAP guidelines. Public comment forms are available on the project web page on OSPI's website.

Appendices

APPENDIX A: 2020 EXPERT PANEL

Due to the impact of the COVID 19 pandemic, OSPI did not convene a panel of experts for the 2020 menu updates. Instead, the LAP team worked with WSIPP and internal OSPI staff to make minor content revisions.

Julia Cramer, M.P.A. (2018–20) is a research associate with the Washington State Institute for Public Policy and conducts research for the state legislature with a focus on K–12 education policy. Her work includes developing an inventory of evidence- and research- based programs for use by school districts in the Learning Assistance Program. Along with the LAP inventory, Julia's research has also focused on National Board Certified teachers in Washington, paraeducators, school safety and security finding, and early childhood education programs. In addition, Julia is a member of the K–12 Data Governance group that oversees development and implementation of an education data system in Washington.

APPENDIX B: ACKNOWLEDGEMENTS

Expert Panel Members

Name	Organization	Title	Year(s)
Aaron Rumack	White River School District	Mathematics Instructional Coach	2017, 2018
Alice Murner	Cape Flattery School District	Principal, Neah Bay Elementary	2015
Allison Hintz	University of Washington, Bothell	Assistant Professor	2015
Ann Neils Ottmar	Cheney School District	Math Intervention TOSA	2016, 2018
Annie Pennucci	WSIPP	Assistant Director	2015
B. Keith Salyer	Central Washington University	Associate Professor	2017
Brian Coon	Seattle Public Schools	Mathematics Instructor	2019
Cathy Carroll	WestEd	Senior Research Associate/ Project Director	2015
Christine Cheng	OSPI	Mathematics Instructional Success Coach	2018
Connie Hatchel	Prosser School District	Mathematics Instructional Coach	2015, 2016
Courtney Ytreeide	Fife Public Schools	Mathematics Intervention Specialist	2019
Doug Clements	University of Denver	Professor, Executive Director of the Marsico Institute of Early Learning and Literacy	2015
Francis (Skip) Fennell	McDaniel College	Professor, Project Director for Elementary Mathematics Specialists and Teacher Leaders Project	2015
Garvin Morlan	Tacoma Public Schools	Secondary Mathematics Instructor	2019
Greta Bornemann	Puget Sound ESD	Director of Mathematics	2015
Janet Zombro	OSPI	Mathematics Instructional Success Coach	2016, 2018

Name	Organization	Title	Year(s)
Janie Overman	Western Washington University	Instructor	2017
Jennifer Burrus	Fife School District	Mathematics Instructional Facilitator	2017
Jocelyn Co	Highline Public Schools	Secondary Math Specialist	2019
John Woodward	University of Puget Sound	Dean, School of Education	2015
Julia Cramer	WSIPP	Research Associate	2018, 2019, 2020
Lesley Maxfield	Spokane Public Schools	Mathematics Instructional Coach	2015, 2016, 2017, 2018
Leslie E.J. Nielsen	Puget Sound ESD	Mathematics Program Manager	2016, 2018
Maegan Skoubo	Raymond School District	National Board Certified Teacher, Math Coach	2016, 2017
Matt Lemon	WSIPP	Research Associate	2015, 2016, 2017
Molly Daley	ESD 112	Regional Mathematics Coordinator	2019
Paulette Johnson	Knappa School District	Superintendent	2017
Rhonda Krolczyk	Morton Elementary	Elementary Teacher	2017
Ryan A. Seidel	East Valley School District	Math and Technology Instructional Specialist	2016, 2017, 2018
Sharon Young	Seattle Pacific University	Professor	2015
Sue Bluestein	ESD 112	Regional Mathematics Coordinator	2015
Tamara Smith	OESD 114	Mathematics Education Coordinator	2015, 2016
Tracy Orr	Granite Falls School District	Alternative School Math Teacher	2016

OSPI Staff, National Advisors, and Consultants

Name	Organization	Title	Year(s)
Amy Thierry	OSPI	Program Supervisor, LAP ELA and Research	2015, 2016, 2017

Name	Organization	Title	Year(s)
Amy Vaughn	OSPI	Program Supervisor, LAP Mathematics and Research	2015
Andrea Cobb	OSPI	Executive Director, Center for the Improvement of Student Learning (CISL)	2017, 2018, 2019
Anne Gallagher	OSPI	Director, Learning and Teaching, Mathematics	2015, 2016, 2017, 2018
Annie Pennell	OSPI	LAP Program Supervisor	2020
Anton Jackson	OSPI	Director, Assessment Development	2015, 2016, 2017, 2018, 2019, 2020
Arlene Crum	OSPI	Director, Learning and Teaching, Mathematics	2019, 2020
Ben King	OSPI	Communications Consultant, Communications	2019, 2020
Carrie Hert	OSPI	Executive Assistant	2015, 2016, 2017, 2018, 2019, 2020
Caryn Sabourin Ward	National Implementation Research Network	Senior Implementation Specialist	2015, 2016
Dean Fixsen	National Implementation Research Network	Co-Director	2015
Dixie Grunenfelder	OSPI	Director, K-12 System Supports	2016, 2018
Estela Garcia	OSPI	Administrative Assistant	2017, 2018
Faith Rackley	OSPI	Secretary Senior, Title I, Part A, Highly Capable & LAP	2020
Gayle Pauley	OSPI	Assistant Superintendent, Special Programs and Federal Accountability	2015, 2016, 2017, 2018, 2019, 2020

Name	Organization	Title	Year(s)
Gil Mendoza	OSPI	Deputy Superintendent, K–12 Education	2015, 2016
Heather Hebard	OSPI	Program Supervisor, LAP ELA and Research	2019
Jami Peterson	OSPI	Executive Assistant	2015, 2016, 2017, 2018, 2019, 2020
Janet Zombro	OSPI	Instructional Success Coach-Mathematics	2015, 2016
Jason Miller	OSPI	Assistant Director, Title I, Part A/LAP	2020
Jennifer Judkins	OSPI	Mathematics Assessment Specialist, High School	2015, 2016
Jess Lewis	OSPI	Program Supervisor, Behavior and Discipline	2015
Jon Mishra	OSPI	Director, Title I, Part A/LAP	2020
Jordyn Green	OSPI	Data Analyst, Student Information	2015, 2016, 2017
Joshua Lynch	OSPI	Program Supervisor, Student Discipline and Behavior	2016, 2017, 2018, 2019, 2020
Julie Chace	OSPI	Administrative Assistant	2016
Julie Wagner	OSPI	Mathematics Assessment Specialist, Grades 3–5	2015, 2016,
Kathe Taylor	OSPI	Assistant Superintendent, Learning and Teaching	2016, 2017, 2018, 2019
Katy Absten	OSPI	Mathematics Specialist	2015, 2016, 2018
Kelcey Schmitz	OSPI	Program Supervisor, Integrated Student Supports	2017, 2018, 2019
Kevan Saunders	OSPI	Administrative Assistant	2015, 2016
Kim Andersen	OSPI	COE Mathematics Specialist	2015
Kimberlee Cusick	OSPI	Secretary Senior, LAP	2015, 2016, 2017

Name	Organization	Title	Year(s)
Kristi Coe	OSPI	Program Supervisor, LAP Mathematics and Research	2017, 2018, 2019
Larry Fazzari	OSPI	Program Supervisor, Title I/LAP and Consolidated Program Reviews	2017, 2018, 2019
Lesley Siegel	OSPI	Alternate Assessment Coordinator	2015
Michaela Miller	OSPI	Deputy Superintendent	2017, 2018, 2019, 2020
Paula Moore	OSPI	Director, Title I/LAP and Consolidated Program Reviews	2016, 2017
Penelope Mena	OSPI	Program Supervisor, Title I, Part A/LAP and Consolidated Program Reviews	2017, 2018, 2019
Porsche Everson	Relevant Strategies	President, Project Facilitator	2015, 2016, 2017
Samantha Diamond	OSPI	Research Analyst, LAP	2017, 2018, 2019
Serena O'Neill	OSPI	Mathematics Assessment Specialist, Assessment Development	2020
Sheila Gerrish	OSPI	LAP Program Supervisor	2020
Tania May	OSPI	Director, Office of Special Education	2019
Wendy Iwaszuk	OSPI	Program Supervisor and State Transformation Specialist	2015

APPENDIX C: LIST OF ACRONYMS

Acronym	Definition
AI	Active implementation
AMTE	Association of Mathematics Teacher Education
AVID	Advancement Via Individual Determination
AYD	Academic Youth Development
CAST	Center for Applied Special Technology
CCSS	Common Core State Standards
CEDARS	Comprehensive Education Data and Research System
CISL	Center for the Improvement of Student Learning
CTE	Career and Technical Education
DEL	Department of Early Learning
DLD	Digital Learning Department
ELA	English language arts
EL	English learner
EQUIP	Educators Evaluating Quality Instructional Products
ERIC	Education Resources Information Center
ESD	Educational Service District
ESSB	Engrossed Substitute Senate Bill
GPA	Grade point average
IAB	Interim assessment blocks
ICA	Interim comprehensive assessment
IEP	Individualized education plan
IMET	Instructional Materials Evaluation Tool
ISS	Integrated Student Supports
LAP	Learning Assistance Program

Acronym	Definition
MPIR	Mathematically Productive Instructional Routine
MTSS	Multi-Tiered System of Supports
NCTM	National Council of Teachers of Mathematics
NIRN	National Implementation Research Network
OSPI	Office of Superintendent of Public Instruction
PD	Professional development
PLC	Professional learning community
RCW	Revised Code of Washington
RTI	Response to intervention
RTL	Readiness to learn
SBAC	Smarter Balanced Assessment Consortium
SERC	State Education Resource Center
SISEP	State Implementation and Scaling up of Evidence-based Practices
STEM	Science, Technology, Engineering and Mathematics
TPEP	Washington State Teacher/Principal Evaluation Project
VMI	Vermont Mathematics Initiative
WISSP	Washington Integrated Student Supports Protocol
WSIPP	Washington State Institute for Public Policy

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Download this material in PDF at *https://www.k12.wa.us/student-success/support-programs/learning-assistance-program-lap/menus-best-practices-strategies*). This material is available in alternative format upon request. Contact the Resource Center at 888-595-3276, TTY 360-664-3631. Please refer to this document number for quicker service: 20-0020.

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