Secondary Supplemental Mathematics Course: Just-in-Time Supports

Teachers need to show students they believe in them, they need to give them opportunities to struggle and fail, they need to communicate that mistakes and struggle are good, and they need to stop deciding who can and who cannot do math.

-Jo Boaler

Introduction

The secondary supplemental mathematics course is designed to provide just-in-time, customized support for students during the school day who would benefit from extra scaffolded instruction in addition to their core mathematics course. Despite being an elective mathematics course that does not carry mathematics credit, it should be taught by a certified mathematics teacher because it is intended to increase student understanding and achievement by increasing time and intensity on grade level core standards. Instructional strategies that are used in the just-in-time support course should align with NCTM's effective Mathematics Teaching Practices and value each learner's mathematical identity. When students are given the opportunity to use agency in authentic application of acquired knowledge, essential skills, and dispositions, they build confidence as mathematical problem solvers. This course should be inclusive of **all** student populations, including general education students, special education students, and English language learners. When applied effectively, as described in this document, this course will both build student confidence and reduce the likelihood of students repeating their core mathematics course. The recommendations made in this document align with those suggested in Utah's Multi-Tiered System of Supports (MTSS) Critical Components, as well as those made in the Personalized Competency-Based Learning (PCBL) Framework.

The just-in-time support course is personalized for each student in order to bridge a student's funds of knowledge to grade level content. Inherent in the intentional bridging is helping students make new, grade level content connections to previous mathematical concepts. A policy that supports this understanding of the just-in-time support course includes allowing students to earn passing credit for

any previous year's mathematics course when a student demonstrates competency in a just-in-time support course. This can be done by awarding "P" credit on a student's transcript for the course that was previously failed using the core math course code with DCA added to the title. For example, if a student fails a quarter of Secondary Mathematics I but is successful in the Just in Time Supports course, that student's transcript should indicate that demonstrated competency through assessment was awarded for the failed Secondary Mathematics I quarter using the Secondary Mathematics I course code with "Sec Math I - DCA" for the course title.

[Note to administrators designing LEA or school wide implementation](#)

[Note to those teaching this course](#)

Identifying students

To determine which students would benefit from the just-in-time support course, it is essential to look at several key data points. Local education agencies (LEAs) /school site teams should establish guidelines that look at data trends, including state, district, diagnostic, and common formative assessments that monitor students' progress over time, e.g., data trends over the past 3 years. In addition to these data based methods, student interest in this type of support should play a primary role in the identification process.

Data points may include:

- attendance
- overall GPA
- cumulative credits
- state, district, and school common formative assessments
- teacher recommendations
- performance in grade level core math class
- student interviews

* Note: students should not be placed based solely on attendance or homework completion.

Course Guidelines

Based on data and research from both local and national levels, the following guidelines have proven to be effective in a support mathematics course. Each guideline is described in more detail below and specific examples can be found in the appendix.

- Positive Classroom Culture
- Effective Class Structure
- Team-based Problem Solving
- Instructional Strategies to Support Grade-Level Content
- Data-based Decision Making

Positive Classroom Culture

Creating and maintaining a positive classroom culture is one of the key elements of a successful learning environment and thus teachers should actively work towards creating a culture that encourages participation and student success. If just-in-time support courses don't create a positive classroom culture, they will not be effective. Support class environments should have the following characteristics in order to make them productive complements to core classes:

- **Growth Mindset (teacher)**
  Teachers need to believe that all students can improve and succeed in mathematics. This includes modeling of productive struggle and patience when mistakes are made.

- **Growth Mindset (student)**
  To build student confidence, teachers provide opportunities for students to engage in productive struggle, use the standards for mathematical practice, promote discourse to explain reasoning, and encourage students. Students should know "no one is born knowing math, and no one is born lacking the ability to learn math." Jo Boaler

- **Positive**
  Students in support classes benefit from a positive, mistake-tolerant classroom environment. Mistakes should be treated as learning opportunities.

- **Variety of Approaches**

Classes should be taught using a variety of different instructional approaches to support different learners.

- **Rigor**
  Just-in-time support classes should be based around grade level content as well as the supporting content that allows students to grasp the core content. The mathematical practices should be taught both explicitly and implicitly. (USCC)

- **Inclusive**
  Classrooms should be responsive to those of different cultures and backgrounds.

Challenges:

- **Poor Prior Classroom Experience**
  Even though many students (and some teachers) may not have experienced the desired positive classroom culture described, the efforts to construct such a supportive environment will be rewarded in the interpersonal relationships and student performance.

- **Fixed Mindset**
  Shifting from a fixed mindset to a growth mindset can be challenging and take time and effort but the benefits are worth the investment.

References:

Dweck, C. (2006). *Mindset: The new psychology of success.*

Boaler, J. (2016). *Mathematical Mindsets: unleashing students potential through creative math, inspiring messages and innovative teaching.*

National Council of Teachers of Mathematics (2014). *Principles to Actions.*

Smith, M., Stein, M.K. (2011). *5 Practices for Orchestrating Productive Mathematics Discussions*

Effective Class Structure

All effective mathematics courses should be designed around ensuring each student has access to the course learning intentions and is held to high expectations in reaching those intentions. To ensure the just-in-time support course meets this goal, a structured protocol based on student needs should be put in place by each LEA. This protocol should be based upon characteristics of effective support programs:

- **Small class size (less than 20)**
  Because this is a targeted math course, it should be for a small percentage of students who would benefit from additional math instruction in conjunction with their core mathematics class.

- **Course-level**
  In order for effective front loading to occur, the supplemental math intervention course must contain students in the same foundational math course (e.g. students in Secondary I).

- **Consistency**
  Institute of Education Sciences (IES) What Works Clearinghouse recommends that interventions are provided for 40 minutes, 4 to 5 times each week, during the school day. Interventions provided through a "homeroom" period that meets for only 10 - 15 minutes do not meet long enough in order for the intervention to be effective.

- **Goal setting**
  Students should set realistic goals and monitor progress themselves. These goals should lead them to exiting the intervention course.

- **Groupings**
  A variety of grouping strategies should be used in order to provide multiple learning opportunities for students. This includes individual, small group, and whole group instruction.

- **Technology**

Use of technology is a way to provide differentiated support for different student populations or to illustrate/explore mathematics and should only be used to enhance learning.

- **Targeted group instruction**
  During class time, the intervention teacher should pull small groups of students to work on targeted mathematical proficiencies.

- **Promote student discourse**
  Instructors can engage students in productive discourse through numerous supports including sentence frames, number/math talks, frayer models, language supports, student-to-student feedback loops, and targeted questioning strategies.

Challenge:
- **Differentiation/Personalization**
  The instructor needs to balance individual and group needs in a manner that maximizes time allotted for the course, fills gaps, and relieves anxiety of topics.

References:

IES (2009). *What Works Clearinghouse: Assisting Students Struggling with Mathematics.*

Enu, J. (2015). *Effect of Group Size on Students Mathematics Achievement in Small Group Settings.*

Hattie, J. (2009). *Visible Learning: A synthesis of over 800 meta-analyses relating to achievement.*

Team-based Problem Solving

The purpose of team-based problem solving is to ensure that there is consistent collaboration between core and just-in-time support teachers. Consistent collaboration is imperative for a successful just-in-time support course. Common elements of Professional Learning Communities (PLCs) as described by DuFour include establishing common pacing, addressing standards and the big ideas, creating common assessments, analyzing data and leveraging school structures.

Recommendations for Team-based Problem Solving:

- **Standards and Big Ideas**
  Core and support teachers should collaborate to unpack standards, determine big ideas, build a progression, discuss how to access background knowledge, and identify appropriate interventions and activities. Teachers should discuss intended learning outcomes for students, such as success criteria related to the standards.

- **Common Competency-Based Assessments**
  Students have equal access to the curriculum when all teachers work together to ensure student understanding of standards. Common assessments created by teachers promote effective practices across teacher teams, deepen teacher understanding of standards, and reveal student learning. Common assessments may include, but are not limited to, exit tickets, quizzes, class starters, unit assessments, etc.

- **Data**
  Analysis of data assists teachers in improving instruction by sharing effective strategies. Sharing data over time allows for progress monitoring of student learning and illuminates which standards may need re-teaching. Data are also used to determine when students are ready to exit the support course.

- **School Structure**
  Core and support teachers should be allotted specific time for collaboration, including planning and observation/feedback opportunities, to support them in achieving the essential elements mentioned above.

- **Pacing**
  The just-in-time support mathematics course is most effective when pacing is similar to the core course. Students in a support course may have different core teachers, thus common pacing among the core course and the support course is essential.

Challenges:

- **Lack of Collaboration Time**
  By building collaboration time into all teachers' schedules, schools can set just-in-time support classes up for success.

- **No Common Pacing Guide**
  Establishing and following district/school pacing guides supports effective collaboration for all teachers.

- **Non-Collaborative Mindset**
  Committing to a growth mindset across mathematics teams is an imperative when pursuing this work.

- **No Teacher Leader**
  When there is a facilitator (teacher leader) in charge of planning for PLC time, the meetings are goal driven, the members are more accountable and more is accomplished.

References:

Briars, D. (2012). *Common core mathematics in a PLC at work*.

DuFour, R. (2010). *Learning by doing a handbook for professional learning communities at work* (2nd ed.).

All Things PLC. www.allthingsplc.info

Fisher, D., Frey, N., Hattie, J. (2018). *Developing Assessment-Capable Visible Learners, Grades K-12.*

Instructional Strategies to Support Grade Level Content

The just-in-time support course is intended to increase student understanding and achievement by increasing time and intensity on grade level core standards. Each student is provided customized supports in a timely fashion to achieve their potential. This course may include:

- **Front Load (Pre-Teach)**
  Front loading helps students connect background knowledge to new learning and gives learners a head start. Research indicates that students who receive front loading of core concepts and skills master the content in significantly less time than students who receive the instruction for the first time. Front loading math concepts in a support mathematics course setting can provide students the benefit of additional time actively engaged with concepts and build their confidence to participate in the core mathematics class. (See Front Loading in the appendix for more information).

- **Re-teaching (Spiraling)**
  using different teaching strategies should also be present. Both of these approaches can be blended into a class period and should include daily goals that are in the grade level core content and practice standards.

- **Mini Lessons**
  There may be opportunities to design mini-lessons for prerequisite skills. These prerequisite skills should be directly related to the grade level core standards.

- **Complexity**
  It is important to go beyond Depth of Knowledge (DOK) 1 questioning in the math support course. Students should be exposed to all levels of DOK in the support course through high-level questioning. Task based learning also allows students to reach higher levels of DOK\

- **Language Acquisition**
  Language acquisition practices should be leveraged, including opportunities for the students to engage in listening, reading, speaking and writing about mathematics.

- **Instructional Routine Structures**
  Routines such as Frayer models (multiple representations, academic vocabulary), Number Talks, students sharing work and making connections between strategies, and Five Practices for Orchestrating Productive Discussions can be leveraged to support student learning.

Challenges:

- **Below Grade Level Instruction**
  Although teachers may be inclined to spend time directly teaching below grade level pre-requisite skills, students can acquire these skills through differentiated math tasks while learning grade level content.

- **Inadequate Support of Instruction**
  Teachers should use the many resources available to them (PLCs, school/district materials and activities, NCTM teaching practices, etc.) in designing instruction and tasks.
- Inadequate differentiation provided

References:
Free Resources. (n.d.). Karin Hess, PhD. https://www.karin-hess.com/free-resources

Smith, M. S., & Stein, M. K. (2011). *5 Practices for Orchestrating Productive Mathematics Discussions*. Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics (2014). *Principles to Actions.*

Data-based Decision Making

The purpose of data-based decision making is to assess student progress toward learning grade level core standards. Data collection and analysis take many forms, informally and formally, and the process occurs continuously so that both the student and educators are measuring progress of student learning toward mastering standards. Data are important for placing students in a just-in-time mathematics support course,determining if the support is effective and empowering a student to demonstrate that the support is no longer necessary. Data also allows teachers to monitor student progress and to determine when a student may successfully exit the support course.

Recommendations for Data-based decision making:

- **Collaboration**
  The math site team (PLC) collaborates regularly to create common assessments. These common assessments are used to determine the mastery level of all students, including students attending just-in-time support courses. The results of students in support courses should be compared to the overall class results. Core math teachers gather formative and summative data in the core math class and then share that data with the math support teacher. A math support teacher may choose to repeat the summative assessments in math class to assess progress.

- **Formative Assessments**
  In addition to the data from the core math course, the math support teacher will need to use continual formative assessments in the support course to check for understanding. These supports are the product of a system of intentional formative assessment strategies and feedback loops that drive educators to personalize learning paths for students based on their growth or demonstration of competency.

- **Demonstrated Competency**
  Once initial placement has been made, some of the same data points can be used to track student progress and support course effectiveness. Such as

state, district, and school common formative and summative assessments, performance in grade level core math class, and data from math software.

- **Using data to exit a student from the support course**
  The core class teacher, the support course teacher, and the student should collaborate to determine whether the student is ready to exit the just-in-time support course. Typically this is done at quarter or semester breaks. One important question to keep in mind when trying to determine if a student is ready to exit the support course is, "Is the support course the reason the student is successful and can they be successful without the support course?" Student input is sometimes helpful when trying to determine the reason for success and whether a student is ready to exit the intervention course.

- **Using data to place students during the school year**
  As openings in the support class occur, it is likely that the math site team will recommend other students to enter the support class. Teacher recommendations and common assessments are effective ways to determine the students with the greatest need. This should be done as part of PLC time at quarter or semester breaks.

Challenges:

- **Too Much Data**
  While collecting data is essential, gathering too much data can be overwhelming. Gathering and analyzing data from a few key assessments rather than from every formative and summative assessment will give the necessary feedback while not overloading teachers.

- **Lack of Common Assessments**
  Creating and using common assessments allows teachers to monitor progress and identify areas that need further support.

- **Insufficient Follow-Up**

To promote success for students who are exiting a support course, data should be collected to verify that they are succeeding in their core course. Data-based decision protocols should be leveraged in this effort.

References:

Bambrick-Santoyo, P. (2010). *Driven by Data.*

Bambrick-Santoyo, P. (2012). *Leverage Leadership.*

Knight, J.(2012). *High-Impact Instruction.*

Appendix

Note to Administrators Designing LEA Implementation:

The following recommendations are structures that ensure success for the Just-In-Time supplemental mathematics course across a school or district:

- **Create buy-in**
  Ensure all stakeholders (administrators, math teachers, intervention specialist, counselors, parents, students) have a clear vision of the course, including both what the course is and is not. Promoting success criteria for this course, including remediation prevention or to allow students to make up credits by showing competency, will support creating and maintaining buy-in. Use the Just-in-Time Supports Guidance document to support this work.

- **Credit-recovery**
  The just-in-time support course is personalized for each student in order to bridge a student's funds of knowledge to grade level content. Inherent in the intentional bridging is helping students make new, grade level content connections to previous mathematical concepts. A policy that supports this understanding of the just-in-time support course includes allowing students to earn passing credit for a previous year's mathematics course when the student demonstrates competency in a just-in-time support course.

- **Select teachers**
  Effective Educators of this course (and in general) believe students are capable of learning at high levels, focus on building quality relationships, understand how to cultivate a growth mindset, know how to create effective structures to support learning (e.g., small group instruction, centers, and whole group instruction), and collaborate well with colleagues.

- **Spread the Message**
  Promote the common vision to achieve goals and outcomes among all stakeholders so that students are successful on grade level content. Messaging may include providing a parent letter to share goals and intended support for the course, student letter inviting students to the course, and/or

presenting at a Board meeting to share benefits of course (student success, reduced retention, cost savings, etc).

- **Prioritize the Schedule**
  Consider building the master schedule so that students are with their peers as much as possible and that the support class is in addition to the primary course. If the school is on the block schedule, the support class should be offered on the opposite day of core math class as well as offered at an optimal learning time to maximize student attendance and attention. Schedule prep periods so that the Just-In-Time supplemental course teacher (who should be an endorsed mathematics teacher) has time to collaborate with the core teacher(s).

- **Ensure Follow-Through**
  Set up a system that includes regular check-ins with stakeholders to make sure the course is going as intended and supports are being provided, as needed. Ensure assessment mechanisms provide students opportunities to enter and exit the course, when support is required or when success criteria are achieved.

Diagnostic Assessments: Some diagnostic assessments could include: ALEKS, Scholastic Mathematics Inventory (SMI), Imagine Math, Khan Academy

Note to those teaching this course:

Because of the importance of this course, care should be taken when selecting instructors. Teachers of this course should embody the following attributes when teaching this course:

- Organize and manage small group instruction
- Build quality relationships through effective social/emotional learning
- Use data-focused competency-based assessment mechanisms to monitor student progress
- Use evidence-based practices
- Engage in professional learning opportunities and intradistrict PLCs
- Collaborate with foundational course teacher
- Develop and promote teacher and student efficacy and agency

● Possess and cultivate a growth mindset

Data Driven - Formative Assessments
- exit tickets: A short activity/task that is done at the end of a class period. It is usually done on small pieces of paper or index cards and handed to the teacher as students exit the class much like a movie theater ticket. It could be a writing assignment to summarize learning for the day, a short quiz, or a background check for tomorrow's lesson.
  - Resources
    - [27 Easy Formative Assessment Strategies For Gathering Evidence of Student Learning](#)
    - [Teach Like a Champion - Jordan Thompson](#)
    - [A Favorite Formative Assessment: The Exit Slip By Rebecca Alber](#)
- white boards: Teachers pose questions or tasks and then ask students to provide answers on white boards. Students reveal their answers simultaneously. This quickly helps teachers to see which students are on the right track and which students may still be struggling with a concept. The differences in answers can be used to launch a discussion about the problem or task which will deepen the understanding of all students.
  - Resources:
    - [8 Great Ways to Use Whiteboard in the Classroom](#)
    - [27 Easy Formative Assessment Strategies for Gathering Evidence of Student Learning](#)
- response cards: They are similar to whiteboards, but are typically used to communicate a student's level of understanding. It can be done in several ways: index cards with "yes" on one side and "no" on the other side, colored index cards with red representing "I don't understand," yellow representing "not sure," and green representing "I understand," etc.
- quick check: Free online software allows students to use their own device (cell phone, tablet, or computer). Teachers can immediately see which students answered correctly and incorrectly. Results can be displayed for the whole class in real time.
  - Resources
    - [Socrative](#)
    - [Kahoot](#)

- - ■ [Poll Everywhere](#)
- fist to five: Students can use a scale of 0 (fist) to 5 (all 5 fingers) to indicate their level of agreement, readiness for tasks, or comfort with a concept or skill they are learning. Teachers should specify what each level represents to meet their specific needs in the classroom. An example would be: 0= not ready, 1-2=struggling, 3=on my way, 4=ready to go, 5=ready to go and highly motivated.
- turn-to-your neighbor: After students have been asked to work on a problem or task individually, they can turn to their neighbor and compare answers or ideas. Teachers usually ask students to explain their thinking and come to an agreement with their neighbor if there is a discrepancy in answers or ideas.
- paraphrasing: Having students use their own words to describe what they learned or heard during a lesson.
- think-pair-share: Assigning students a task to complete individually for a few minutes. After some time, allowing students to work with a partner to compare similarities and differences in their process and answers. Then having students share with the entire class how they approached the task.
  - ○ Resources
    - ■ [Think-Pair-Share](#)
    - ■ [Increase Student Interaction With "Think-Pair-Shares" and "Circle Chats"](#)
    - ■ [The Teacher Toolkit - Think-Pair-Share](#)
- graphic organizers: A way for students to organize information in a visual representation.
  - ○ Resources
    - ■ [EduPlace - Free Graphic Organizer Templates](#)
    - ■ [Teacher Vision - Graphic Organizer Templates](#)
- jigsaw: Students are assigned to two different groups. The first group is the "expert" group. In this group they will become an expert at a skill, a concept, or a reading passage. Once students have become experts, they move into their second group where each member has become an expert in a different skill or concept. The team members share their expertise with each other.
  - ○ Resources
    - ■ [The Teacher Toolkit - Jigsaw](#)

- gallery walk: In small groups, students create a poster or chart to demonstrate their knowledge about a concept. When the groups are done they hang the posters or charts on the walls and the class walks around looking at all of the different posters or charts. This can be run similar to a jigsaw activity and have one student from each poster group form a group and as they walk around looking at the posters, the student who helped create the poster can explain it.
  - Resources:
    - [The Teacher Toolkit - Gallery Walk](#)
- four corners: Teachers pose a question to students and then have them stand in one corner of the room based on their answer. While students are in their designated corners they can discuss why they chose the answer they did and then share that thinking with the rest of the class.
  - Resources
    - [Teacher Thrive - Cooperative Learning Strategies](#)
- bell work (or warm-ups): A short task given to students to work on as they enter the classroom. It could be a short quiz, a writing assignment, or a couple of problems to see if they have sufficient background knowledge or have mastered the previous day's concept. Once students have completed the task, the teacher and students should discuss it.

Front Loading

Another key element to the mathematics support course is front loading, also known as pre-teaching. Front loading helps students connect background knowledge to new learning and gives learners a head start. Research indicates that students who receive front loading of core concepts and skills master the content in significantly less time than students who receive the instruction for the first time. Front loading math concepts in a support mathematics course setting can provide students the benefit of additional time actively engaged with concepts and build their confidence to participate in the core mathematics class. The Utah Standards [Major Works](#) documents are helpful in identifying work from previous grades and the big ideas of the grade.

Front loading instruction should be explicit and systematic. The instruction should also align with NCTM's recommendations for best teaching practices. It is recommended that this instruction include:

- modeling of effective problem-solving
- a variety of teaching strategies, including:
    - manipulatives and visual representations to connect concrete examples to abstract concepts (CRA)
    - verbalization of thought processes
    - guided practice with corrective feedback
- use of appropriate grade level math technology software to build grade level fluency and efficiency (no more than 25% of class time)
- multiple representations to make connections
- literacy strategies to introduce vocabulary

Challenges:
- **Inadequate Collaboration**
  Effective collaboration between the core and support teachers is essential so that front loading of the correct concepts is achieved. Periodic assessments can highlight which learning outcomes should be targeted for front loading.

- **Lack of Common Pacing Guide**
  A common pacing guide allows core and support teachers to know which topics are coming up and best design front loading for those concepts at the appropriate time.

References:

IES (2009). *What Works Clearinghouse: Assisting Students Struggling with Mathematics.*

Association of Teachers of Mathematics (2018). *Changing Lives and Providing Equity Through Pre-teaching and Assigning Competence*.