Measures & Interventions for Numeracy Development (MIND):

Skill Remediation

Intervention Manual

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The MIND Intervention Manual

The Problem

Educators generally agree that the end goal of math instruction is for students to be able to use numbers to solve complex problems (i.e., develop mathematical understanding). Unfortunately, current curricula and/or instructional approaches are not resulting in the desired outcomes. Recent practices have resulted in suffering tests scores showing that 58% of fourth graders and 64% of eighth graders are performing below the proficient level on state tests designed to measure broad math scores (National Center for Educational Statistics, 2013). Although a variety of factors contribute to achievement deficits, one skill area where U.S. students clearly struggle is computation proficiency (National Mathematics Advisory Panel; NMAP, 2008; Stickney, Sharp, & Kenyon, 2012). This is problematic as research has repeatedly shown that students who have deficits in computation skills also struggle in solving more complex problems associated with popular goals such as problem solving, critical thinking, and math reasoning (Duhon & Poncy, 2015; Stein, Kinder, Silber, & Carnine, 2006; VanDerHeyden & Burns, 2009).

The Solution

Although debate exists about the importance of computation fluency, research supports the notion that computation fluency is critical for the development of complex math skills (NMAP, 2008). Specifically, it has been shown that interventions directly targeting computation fluency have caused demonstrable performance increases on assessments targeting broad math skills (e.g., state test scores) (Duhon & Poncy, 2015; McTiernan, Holloway, Healy, & Hogan, 2016). From a task analytic perspective this makes sense as nearly all application and/or word problems contain numbers and operations in some form (Stein et al., 2006). This being the case, computational proficiency (i.e., fluency) is essential as it provides a foundation for students to benefit from instruction targeting conceptual understanding and associated skills such as problem solving, critical thinking, and math reasoning. Consistent with this research, the purpose of both the *MIND: Facts on Fire* & *MIND: Skill Remediation* is to present teachers with interventions and materials that efficiently increase computation proficiency.

What is the MIND?

The MIND is set of resources used to supplement core math instruction and provide intensive remediation targeting computation skills. To accomplish these goals two scripted (i.e., standard protocol) intervention programs have been developed. The first is *MIND: Facts on Fire*; this package is a school-wide, short duration (4 minutes/day), Tier 1 intervention designed to prevent skill deficits and enhance broad math achievement. The second is *MIND: Skill Remediation*; this package prescribes intensive computation instruction for struggling students in an effort to remediate identified skill deficits (e.g., Tier 2). Both of these programs were constructed using four guiding principles: 1) interventions are empirically validated, 2) interventions are high intensity and short duration, 3) curricular objectives are carefully sequenced, & 4) assessment data are used to guide educational decisions emphasizing student mastery.

MIND: Skill Remediation – The Skills

MIND: Skill Remediation contains four packets (addition, subtraction, multiplication, division) that were designed to provide teachers with instructional materials for students who have computation deficits. Specifically, empirically-validated interventions such as Cover Copy Compare (CCC) and Explicit Timing (ET) are imbedded across a sequenced set of skills. Students' progress across these skills until computational proficiency (i.e., mastery) is demonstrated by meeting preset Digit Correct Per Minute (DC/M) criteria. To assist and simplify implementation materials are included that outlines intervention procedures & guides student training. Each operation packet has three sections that target a skill area:

1) Building Computation Proficiency: The first section of each packet focuses on student mastery of basic math facts. To begin this section students must be able to use counting strategies to accurately solve basic fact problems. To efficiently teach basic facts the size of problem sets has been reduced to 3 exclusive sets of 24 problems across three Units. The first part of each unit ensures accurate responding by having the students practice using CCC procedures & then combines both CCC & ET later in the Units to provide both structured and independent practice opportunities. Once students can respond at or above 20 DC/M, they move to the second part of the Unit and engage in independent practice using ET until the student can respond >40 DC/M. This is repeated for the following two units until the student achieves mastery across all three Units. Lastly, all of the problems are combined for the student to practice and obtain mastery.

2) Part-Part-Whole Relationships: The second section of each packed was designed to promote student understanding of part-part-whole relationships by providing two tasks: 1) CCC: Fact Families & 2) ET: Cloze Problems. CCC: Fact Families provides opportunities for the student to construct problems from fact families. This knowledge will be helpful when linking acquired basic fact skills to related skills (e.g., addition to subtraction, multiplication to division). The second task for students to complete is ET with Cloze Problems (e.g., 8+__=12). This provides practice to correctly complete problems associated with basic algebra (e.g., a+8=12, what is = to a) and provides prior knowledge to employ strategies (e.g., add up) to complete subtraction problems (e.g., 12-8=__, what +8=12). Student proficiency with these less common approaches to completing basic facts can be helpful to *future* instruction teaching relationships of quantity across operations, algebraic thinking, and flexibility in problem solving (e.g., representing number sentences in multiple ways).

3) Mastering Multi-Digit Problems: The third and final section of each packet contains three Units that use Procedural CCC (P-CCC) with scripted lessons to teach students how to accurately apply basic fact skills to multi-digit computation problems. This set of guided worksheets was designed for students who can fluently complete basic fact skills (>40 DC/M) but are unable to complete multi-digit computation problems above 20 DC/M. This pattern of responding is indicative of a student who lacks automaticity with the procedural skills needed to complete multi-digit problems. P-CCC is a multi-component intervention that incorporates teacher demonstration, guided practice using visual cues, independent practice, and performance feedback with re-teaching (if needed).

Each of these sections has Units that target computation skills and includes an assessment that is administered after completion of the unit to monitor student progress. In addition, specific decision making guidelines are included that will provide you with recommendations for what intervention to do next (i.e., should the student repeat the Unit or move to a more advanced skill). Packets and/or units are available for download free of charge at www.factsonfire.com. The MIND: Skill Remediation packets were designed for use as an advanced tier intervention (i.e., tier 2 or 3) and can be differentiated by dosage (e.g., 1x or 2x per day), however, it is recommended that a student instructional session last around 10 minutes in duration. If the student needs additional practice (i.e., an additional dose) it is critical to distribute these instructional session(s) across the day (e.g., one in the morning, one in the afternoon). Recommendations for implementation are included in the direction at the beginning of each Unit.

MIND: Skill Remediation – The Interventions

1) Cover, Copy, & Compare: This intervention procedure is used across the MIND: Skill Remediation packets and has been empirically validated to increase both accurate and fluent responding (Poncy, McCallum, & Schmitt, 2010; Poncy & Skinner, 2011; Poncy, Skinner, & Jaspers, 2007; Skinner, Turco, Beatty, & Rasavage, 1989). Use with students scoring above 60% ACC and below 20 DC/M. It is recommended that students use CCC procedures with a limited target set (approximately 12-24 items). Three worksheet sets (Set A, Set B, & Set C) containing 24 problems have been created for each of the variations of CCC included in these packets: 1) CCC: Traditional; 2) CCC: Fact Families.

2) Explicit Timing: This intervention procedure is used across of the packets and has been empirically validated to build fluent responding (if a student is inaccurate do not use) (Duhon, House, Hastings, Poncy, & Solomon, 2015; Poncy et al., 2015; Schutte et al., 2015; Van Houten & Thompson, 1976). ET is great for students who score around 20 DC/M and above 90% ACC and implemented by simply providing students with timed practice using fact worksheets. Some of the ET probes contained in the packets have a metric on the right of the page that provides performance feedback to the student and should be used by the teacher to prompt praise &/or reinforcement. Once students can complete the facts >40 DC/M, they are ready to be taught part-part-whole relationships and procedures to complete operation specific multi-digit problems.

3) Procedural Cover, Copy, & Compare: This set of guided worksheets was designed for students who can fluently complete basic fact skills (>40 DC/M) but are unable to complete multi-digit computation problems above 20 DC/M (Poncy, Duhon, Bui, Hansmann, & Moore, 2013). A scripted teacher lesson is included that is yoked to set of worksheets that contain cues to help the students learn the correct procedures to solve multi-digit problems. As the worksheet continues the cues are faded and the student independently responds to the problems. Each section is divided into 3 Units with each Unit building on the previous skill (see table of contents).

Although brief recommendations are provided at the beginning of each Unit, all of the interventions are fully described in Appendix B. For each intervention (CCC, ET, & P-CCC) the following materials will be provided: 1) An intervention Overview; 2) A Student Training Protocol; & 3) Intervention Units. Selected training videos are available at www.factsonfire.com.

Why the MIND: Skill Remediation Packets Work

1. Scope & Sequence: The MIND: Skill Remediation packets were constructed for students to progress across a logical skill sequence to master computation skills. Specifically, facts & procedures are taught to mastery and these skills are used as the foundation to teach future skills. For students who struggle with accuracy &/or fluency basic fact problems are divided into smaller (24 problem) sets to ensure efficient learning. Assessment worksheets and procedures are included to identify student skill patterns and assist educators in selecting the appropriate intervention.

2. Interventions are matched to Student Needs: The use of empirically-validated interventions is essential for student learning; that being said, for an intervention to be effective procedures must also be appropriately matched to the needs of the student. For example, if a student completes 8 DC/M with 60% accuracy (i.e., slow & inaccurate) when completing addition problems, ET with practice worksheets will not be effective. For students who show this pattern CCC would be the correct intervention as it includes components of a model & immediate feedback. Although rates of responding are decreased the saliency of the model & feedback is necessary because the student cannot accurately respond to the problems independently. Similarly, if a student completes 25 DC/M with 98% accuracy (i.e., slow & accurate), using CCC would be less efficient because the student would not need the model & feedback to respond to the problem and the incorporation of these components would drastically reduce rates of responding when compared to using ET. While both interventions are "empirically-validated" to increase computation skills each intervention procedure includes specific instructional components that are designed for students exhibiting specific patterns in responding.

3. The Use of Mastery Criteria: Students who struggle to learn complex skills and concepts often fail to do so because of a lack of automaticity with foundational (i.e., prerequisite) skills. This can be especially true with students with learning difficulties. Automaticity with prerequisite skills has been shown to be beneficial because it increases student rates of responding (i.e., students practice more problems), frees up valuable cognitive resources, & increases rates of reinforcement (e.g., problems are easier, rates of praise are increased) (Poncy, Fontenelle, & Skinner, 2013; Skinner, 1998). Fluent performance enhances these facets of student learning and has also been shown to increase the rates of learning more complex skills (McTiernan et al., 2016; Schutte, 2015). The MIND: Skill Remediation packets use mastery criteria to ensure student proficiency.

4. Intervention Selection & Construction: All the intervention procedures used throughout the MIND: Skill Remediation packets are empirically validated. Specifically CCC is used to prompt errorless learning and increase accurate responding and ET procedures are used to maximize rates of responding and increase fluent responding. These two intervention procedures (or some form of variation or combination) were used throughout the packets in an effort to increase consistency for the student. Once these approaches are taught the students can focus on learning new problems not learning new procedures. Lastly, intervention sessions were designed to last around 10 minutes each day. This ensures that teachers can use this as a supplemental resource and will have ample time to teach other skills, strategies, and/or concepts.

How to Use MIND: Skill Remediation

MIND: Skill Remediation uses a standard protocol approach to intervention delivery. A standard protocol approach provides a standardized set of activities (e.g., instructional placement, intervention producers) and materials (e.g., assessment probes, intervention worksheets) that are pre-arranged and scripted for teachers. Approaches such as these are popular with educators because teachers spend less time locating, printing, and organizing materials and more time delivering empirically-validated interventions that produce improved student outcomes. When using the MIND: Skill Remediation packets teachers will find a well-defined and sequenced approach to assessment, intervention selection, and decision making. Furthermore, all of the assessment and intervention materials (training protocols, directions, worksheets) have been created and are available for download for free. Teachers simply need to follow the outlined procedures and accompanied decision making rules then print out the prescribed intervention Unit to begin remediating the skill deficit of the student.

Step 1: Assess the student & determine skill placement.

- Assess the basic fact target skills using Curriculum Based Measurement (CBM) procedures in the order they are taught (i.e., start with addition, then subtraction, then multiplication, lastly division). To determine skill placement, identify the first skill where the student's score falls below 40 DC/M. Once the target skill is identified go to Step 2.

Step 2: Locate & print the appropriate intervention Unit for the target skill.

- Now that the target skill is identified, document the student's DC/M score and compare to instructional standards to locate the prescribed intervention Unit. If the student's score is below 20 DC/M, begin with Unit 1.11. If the student scores above 20 DC/M begin with unit 1.4. Once the intervention Unit is identified, go to www.factsonfire.com and print it out. ***Note: It is recommended that only one target skill at a time is intervened on***.

Step 3: Implement the intervention Unit.

- If this is the first time the teacher has implemented MIND: Skill Remediation, they will need to read the Intervention Summaries & Protocols section of the manual. If it is the students first time completing a unit, the teacher will need to train the student how to respond to the directions and worksheet activities (see student training protocols). Make sure to follow administration directions & intervention recommendations detailed at the beginning of each unit. Plan on each session lasting approximately 10 minutes & have the student complete **all** of the problems on the assigned worksheets.

Step 4: Assess student with probe at the end of the intervention Unit.

- At the conclusion of each intervention Unit will be a probe used to monitor student progress and inform the next intervention step. Use the outlined CBM procedures to obtain a DC/M score. Document the student's DC/M score and match student performance to the recommended intervention Unit. Repeat steps 2-4 as needed.

Step 1: Assess & Determine Skill Placement

When using the MIND: Skill Remediation packets teachers will find a well-defined and sequenced approach to assessment, intervention selection, and decision making. Teachers simply need to follow the outlined procedures and accompanied decision making rules then print out the prescribed intervention Unit to begin remediating the skill deficit of the student. To accomplish this goal you will need to assess the student across basic facts using Curriculum Based Measurement (CBM) procedures. CBM was developed by Deno & Mirkin (1977) and is an assessment that uses a standardized set of administration and scoring procedures with probes that contain foundational grade-level skills for reading, math, and writing. For the purposes of MIND: Skill Remediation, CBM procedures will be used with single skill probes. It is essential that administration procedures are strictly adhered to. To determine skill placement, follow the following steps and determine the intervention Unit that needs to be implemented.

Task 1: Print out necessary materials.

- CBM administration & scoring directions
- Basic Fact Probes: Addition, Subtraction, Multiplication, & Division (one each)

Task 2: Collect DC/M scores.

- Read directions, give student 1 minute to complete problems, total DC/M
- Only assess skills that have been previously taught.

*Materials & Directions for these tasks are contained in the following 6 pages.

CBM: Administration & Scoring – Pg. 1

Materials.

□ Pencil □ Timer □ Clipboard (optional) □ Administration Directions

□ Scoring Procedures □ Probes

Probes for Assessment to Determine Initial Placement.

To assess for initial placement, use the CBM procedures outline in the previous pages with the following 4 probes. Remember to begin with addition and only assess skills that the student has been taught.

Administration Directions.

- Provide student(s) with pencil and probe.
- Tell students to put their name and date on probe.
- Read the following instructions:

  "The sheet on your desk has (addition, subtraction, multiplication, division) problems. When I say "BEGIN," start answering the problems. Start at the first problem, work across the page then go to the next row. You should work as fast as you can without skipping problems. If you come to a problem that you do not know, mark an 'X' through it and go on to the next problem. Continue working until I tell you to stop. Are there any questions? Ready. Begin"

- When you instruct student(s) to ***"Begin"*** start the timer.
- Monitor student procedural adherence. Prompt student if directions are violated. For example,

  "Please work across the page"
  "Do not skip problems, if you cannot answer it mark an 'X' through it"
  "Keep working until I tell you to stop."

- After 1 minute elapses, tell the student(s) ***"Stop, please put down your pencil."*** Collect probe(s).

Probes for Assessment to Determine Initial Placement

To assess for initial placement, use the CBM procedures outline in the previous pages with the following 4 probes. Remember to begin with addition and only assess skills that the student has been taught.

CBM: Administration & Scoring – Pg. 2

Scoring Procedures.

Although many scoring approaches focus solely on fluency scores, to best match student responding to the optimal intervention accuracy rates are needed as well. To meet these needs it is recommended that student performance is reported using digits correct per minute (DC/M) and percentage of digits correct (ACC). To score each probe, count the number of *digits correct* (DC), count the number of possible digits (i.e., include incorrect digits and/or skipped problems), and record the duration of the assessment period (e.g., 2 minutes). To determine DC/M divide the number of DC by the duration of assessment. To determine ACC divide DC by the number of possible digits and multiply by 100 ((DC/PD)x100=__%).

Basic Scoring Procedures:

1. Score digit correct when the correct number is written in proper column.

2. Score digit incorrect if correct number is not written in proper column or number is illegible.

3. Score digit(s) of problem incorrect if the student marks an 'X' through, or skips, a problem.

4. Score digit as correct if student clearly writes the correct number in reverse

If a student skips over problems it is likely that the child cannot accurately complete the problem or the problem takes a large amount of response effort to complete – regardless the problem is not known to mastery. A DC/M score of a student who skips to complete easy problems and/or avoid difficult problems will not produce a valid representation of the student's computation skill and will result in an elevated DC/M score with high ACC due to the students self-selection of problems. This lack of validity will compromise educational decision making associated with CBM (e.g., screening, progress monitoring).

Scoring Examples.

Basic Fact Computation: Addition, Subtraction, Multiplication, & Division

4	8	7	5	7	3	36	7
+ 5	+ 9	- 4	x 5	x 8	x 8	÷ 6	$9\overline{)72}$
9	16	3	25	63	21	6	
1/1 DC	1/2 DC	1 /1 DC	2/2 DC	0/2 DC	1/2 DC	1/1 DC	0/1 DC

Total: (7/12= 58% ACC)

Deno, S. L., & Mirkin, P. (1977). *Data-based program modification: A manual.* Reston, VA: Council for Exceptional Children.

Probe for Initial Placement: Addition

MIND: Computation TP/ET Worksheet Addition 1 Name: _____ Date: _____

1 + 8	8 + 9	5 + 9	6 + 6	4 + 4	2 + 7	2 + 8	2 + 3	9 + 9
4 + 5	1 + 9	7 + 9	0 + 5	4 + 7	5 + 8	6 + 9	7 + 8	7 + 7
2 + 4	1 + 5	3 + 9	4 + 9	6 + 8	5 + 5	5 + 6	3 + 3	1 + 4
2 + 6	3 + 4	4 + 6	1 + 7	2 + 2	3 + 8	6 + 7	2 + 9	2 + 5
3 + 5	5 + 7	4 + 8	0 + 8	3 + 7	3 + 6	4 + 2	5 + 2	2 + 1
7 + 4	7 + 6	9 + 2	6 + 6	7 + 7	8 + 8	7 + 0	5 + 5	6 + 2
4 + 3	7 + 3	8 + 6	9 + 9	7 + 2	3 + 0	8 + 7	5 + 4	1 + 0
4 + 4	6 + 4	3 + 2	7 + 5	6 + 3	3 + 3	3 + 1	8 + 4	8 + 5

Probe for Initial Placement: Subtraction

MIND: Computation TP/ET Worksheet Subtraction 1 Name: _____ Date: _____

4 - 2	16 - 8	8 - 3	9 - 1	10 - 3	15 - 7	6 - 2	11 - 2	8 - 4
2 - 1	7 - 3	12 - 6	9 - 3	2 - 2	7 - 2	12 - 4	14 - 5	6 - 3
11 - 5	11 - 3	14 - 6	4 - 0	16 - 7	17 - 8	13 - 4	11 - 4	13 - 5
1 - 1	15 - 6	14 - 7	12 - 5	10 - 5	10 - 4	12 - 3	3 - 1	18 - 9
9 - 4	9 - 9	10 - 2	8 - 2	13 - 6	9 - 2	5 - 2	8 - 4	15 - 8
3 - 0	10 - 5	14 - 8	6 - 3	12 - 7	5 - 3	10 - 7	8 - 6	5 - 0
10 - 8	7 - 6	13 - 8	8 - 5	4 - 2	11 - 8	16 - 9	12 - 8	11 - 9
6 - 5	15 - 9	16 - 8	9 - 6	17 - 9	14 - 7	4 - 3	13 - 7	6 - 4

Probe for Initial Placement: Multiplication

MIND: Computation TP/ET Worksheet Multiplication 1 Name: _____ Date: _____

7 × 9	2 × 8	5 × 7	1 × 3	6 × 6	3 × 6	5 × 8	2 × 6	0 × 0
4 × 7	5 × 9	2 × 5	2 × 3	2 × 2	4 × 5	8 × 8	0 × 9	5 × 6
7 × 7	4 × 9	3 × 7	3 × 9	6 × 8	0 × 4	3 × 3	4 × 6	0 × 2
5 × 5	6 × 7	3 × 8	2 × 4	9 × 9	6 × 9	0 × 3	7 × 8	4 × 8
2 × 7	3 × 5	4 × 4	3 × 4	1 × 5	8 × 9	2 × 9	7 × 1	6 × 6
5 × 5	9 × 5	8 × 8	7 × 0	9 × 4	9 × 6	8 × 5	4 × 4	4 × 3
6 × 4	6 × 0	9 × 7	9 × 2	6 × 5	3 × 2	8 × 2	5 × 2	7 × 3
9 × 3	8 × 0	6 × 2	6 × 3	2 × 1	7 × 4	8 × 6	7 × 6	5 × 4

Probe for Initial Placement: Division

MIND: Computation TP/ET Worksheet Division 1 Name: _____ Date: _____

1 ÷ 1	6 ÷ 2	63 ÷ 7	12 ÷ 2	25 ÷ 5	48 ÷ 6	9 ÷ 3	24 ÷ 4	14 ÷ 2
18 ÷ 3	0 ÷ 3	72 ÷ 8	40 ÷ 5	54 ÷ 6	0 ÷ 8	8 ÷ 2	30 ÷ 5	15 ÷ 3
35 ÷ 5	16 ÷ 2	10 ÷ 2	16 ÷ 4	36 ÷ 4	0 ÷ 2	28 ÷ 4	64 ÷ 8	20 ÷ 4
32 ÷ 4	6 ÷ 1	18 ÷ 2	4 ÷ 2	36 ÷ 6	81 ÷ 9	56 ÷ 7	0 ÷ 7	27 ÷ 3
49 ÷ 7	3 ÷ 1	24 ÷ 3	12 ÷ 3	45 ÷ 5	21 ÷ 3	42 ÷ 6	2 ÷ 1	30 ÷ 6
49 ÷ 7	25 ÷ 5	72 ÷ 9	12 ÷ 6	36 ÷ 6	10 ÷ 5	24 ÷ 8	5 ÷ 1	18 ÷ 6
45 ÷ 9	28 ÷ 7	20 ÷ 5	0 ÷ 6	15 ÷ 3	54 ÷ 9	21 ÷ 7	8 ÷ 1	40 ÷ 8
42 ÷ 7	9 ÷ 3	35 ÷ 7	16 ÷ 4	81 ÷ 9	6 ÷ 3	7 ÷ 1	16 ÷ 8	48 ÷ 8

Step 2: Locate & Print the Appropriate intervention Unit for the Target Skill.

Now that you have collected student performance across relevant operations you will need to identify the appropriate target skill for the student to begin with. To do this transfer the student's DC/M score from each fact probe and document it on the MIND Placement Grid. When this is completed align the student's DC/M scores with the delineated instructional standards to locate the prescribed intervention Unit. If the student's score is below 20 DC/M, begin with Unit 1.11. If the student scores above 20 DC/M begin with unit 1.4. Once the intervention Unit is identified, go to www.factsonfire.com and print it out. ***Note: It is recommended that only one target skill at a time is intervened on***.

Task 1: Record student DC/M performance

- Place student DC/M score for each skill assessed on the MIND Placement Grid

Task 2: Determine & Print out the appropriate intervention Unit.

- Determine lowest skill where the student scores < 40 DC/M and print the Unit prescribed by students DC/M score.

    - If score is 0-19 DC/M then print Unit 1.11 of the selected operation.
    - If score is 20-40 DC/M then print Unit 1.4 of the selected operation.
    - If score is >40 DC/M then print Unit 2.1 or Unit 3.1 of the selected operation or move to the next skill.*

*If the student scores above 40 DC/M, the teacher has three options. 1) Select Unit 2.1 to teach part-part-whole relationships, 2) Select Unit 3.1 to teach multi-digit computation, or 3) move to the next operation. This depends on the skills that have been taught and that the student is expected to have mastered.

MIND Placement Grid

Fact Skill	□ Addition	□ Subtraction	□ Multiplication	□ Division
DC/M Score	____ DC/M	____ DC/M	____ DC/M	____ DC/M
If 0-19 DC/M	Print Unit +1.11	Print Unit -1.11	Print Unit x1.11	Print Unit ÷1.11
If 20-40 DC/M	Print Unit +1.4	Print Unit -1.4	Print Unit x1.4	Print Unit ÷1.4
If > 40 DC/M*	Print Unit +2.1 or To Multi-Digit or To Subtraction	Print Unit -2.1 or To Multi-Digit or To Multiplication	Print Unit x2.1 or To Multi-Digit or To Division	Print Unit ÷2.1 or To Multi-Digit

Step 3: Implement the intervention Unit.

The student has been assessed, placed in the appropriate skill, and the prescribed instructional Unit has been identified and printed out. Now the fun begins and you are ready to intervene with your student (or group of students)! If this is the first time implementing the MIND: Skill Remediation packets, you will need to read the Intervention Summaries & Protocols for each of the interventions you will be implementing. Each of the interventions has an overview and a student training protocol. These materials are located in pages 17-23 of this training manual.

If this is the students first time completing a Unit, the teacher will need to train the him/her how to respond to the directions and worksheet activities using the student training protocols. Make sure to follow administration directions & intervention recommendations detailed at the beginning of each Unit. Plan on each session lasting approximately 10 minutes & have the student complete **all** of the problems on the assigned worksheets.

Tips for Success for Implementation of the MIND: Skill Remediation

1. Follow the prescribed sequence. Proficiency of computation skills is critical for students to learn more complex skills. For example, mastery of basic addition assists students in learning subtraction, mastery of multiplication aids in the learning of division facts. Addition and subtraction skills are vital to multi-digit multiplication and division skills. Do not skip remediation of prerequisite skills because they are not taught in the current grade.

2. Adhere to the mastery criteria to ensure that students are ready for the next skill. Student automaticity in subskills is very important and will increase the rates that more complex skills will be learned (e.g., teaching multi-digit regrouping is much more efficient when basic addition facts are mastered). Make sure students surpass the mastery DC/M criteria.

3. Match your dose with the intensity of the problem. If you are working with a 5^{th} grader whose addition skills need remediated, it would be wise to provide a double dose each day. As with most remedial programs the earlier a problem is detected the more quickly students can be caught up. Intense problems require aggressive treatment.

4. Incorporate performance feedback & reinforcement into the MIND. Fluency building activities can get stale quickly. Teachers who are excited for the student to practice hard and increase their speed will get the best results. Examples of how to do this include setting goals (Let's see if you can get to 40 DC/M), challenging students (I bet you can't finish an entire sheet in 6 minutes!), and providing performance feedback (you improved 5DC/M, great job!). It is imperative that the teacher strives to maximize student response rates.

    - A teacher *can* have the student independently work on the MIND packets while they do something else but student learning rates will be significantly enhanced when the teacher interacts with the student using the aforementioned strategies.

5. Group students anytime possible. To maximize efficiency work with multiple students simultaneously. There are many skills & intervention Units that can be taught at the same time.

Cover Copy Compare (CCC)

Target Behavior

CCC was designed to be used with an individual or group of students who need to increase accuracy and fluency when completing basic math facts (i.e., addition, subtraction, multiplication, division). For students who respond inaccurately, CCC provides a model and feedback to ensure errorless learning and for students who respond accurately but slowly (e.g., less than 20 correct digits per minute) CCC provides repeated practice. While CCC will primarily be used in elementary grades, older students with accuracy and/or fluency deficiencies in basic fact skills can benefit as well.

Materials Needed

MIND: Skill Remediation Unit, Implementation Checklist (optional), Pencil, Timer (optional)

CCC Procedures: Student

1. Student looks at the problem and answer (e.g., a math fact problem) and says it.
2. Student covers the problem.
3. Student writes the problem and answer in space provided.
4. Student uncovers the model and checks for accuracy.

CCC: Intervention Procedures

1. Document date, start time, & end time: This is useful when investigating student response to intervention. You can answer how often and consistently CCC: Standard was done and how many instructional minutes were spent with the student engaged with CCC. □
2. Read the following directions if giving the student unlimited time to complete the CCC: Standard worksheet, "Here is/are your CCC worksheet(s), I want you to complete all of the problems. When you have finished all of the problems, raise your hand and I will collect your worksheet(s). Ready, Begin." □

Remember to constantly be walking around the room to prompt and/or help students who are not working. Look for any mistakes and give students feedback so they can correct any incorrect response(s). □

CCC: Standard – Student Training Protocol

Use this to train students how to use CCC: Standard procedures. The steps are as follows:

1. Open the MIND: Skill Remediation Unit to a CCC worksheet and instruct the student(s) to write his/her name at the top of the paper.

2. Read the following directions, "Today you are going to do something new. You are going to do math problems using something called Cover, Copy, and Compare. (Pause) Look at your worksheet. On the worksheet you will see columns of math problems with an empty space next to each problem, you are going to use Cover, Copy, and Compare to complete these".

3. Continue reading, "Doing Cover, Copy, and Compare is easy. Look at the first problem. It is (read problem & answer). When doing Cover, Copy, and Compare you begin by looking at the problem and saying it to yourself. With this problem it is (read problem & answer). Next, you cover the problem and answer with your hand, please cover it. After it is covered, then you write the problem and answer in the space directly next to it. Please write the problem and answer in the blank space. After you have written the problem and answer uncover it and check to see if what you wrote is correct. (Pause) Did you write the correct problem & answer? If you have written the wrong problem and answer then cross it out and write in the correct problem or answer beside it . Do you have any questions? (Pause)

4. Continue reading, "Now let's try the next problem it is (read problem & answer). Remember look at the problem, say it to yourself, and then cover it. Next, write the problem and answer (Pause for students to complete the step). Lastly, uncover the problem to see if you did it correctly. When you have written the problem and answered it correctly then go to the next problem. Complete these until you have finished the sheet.

5. If you have any questions, or are unsure of how to do Cover, Copy, and Compare then let me know and I we will go over the procedure again.

6. Repeat as necessary

This training script is generally successful for a majority of students. Continuously observe the student and provide performance feedback and reinforcement as necessary. If administering the MIND: Skill Remediation Units to a group of students or a class, cycle though the room to check for adherence to protocol. In addition, point out students who are doing the steps correctly and provide behavior specific praise for correctly implementing CCC steps.

CCC: Fact Families – Student Training Protocol

Use this to train students how to use the CCC: Fact Families procedures. The steps are as follows:

1. Open the MIND: Skill Remediation Unit to a CCC worksheet and instruct the student(s) to write his/her name at the top of the paper.

2. Read the following directions, "Today you are going to do something new. You are going to do math problems using Cover, Copy, and Compare. (Pause) Look at your worksheet. On the worksheet you will see columns of math fact families with two empty spaces next to each fact family, you are going to use Cover, Copy, and Compare to complete these".

3. Continue reading, "Doing Cover, Copy, and Compare is easy. Look at the first fact family. It is (read fact family). When doing Cover, Copy, and Compare you begin by looking at the fact family, making a problem from the family, and saying it to yourself. With this fact family a possible problem is (read problem & answer). Next, you cover the fact family with your hand and you write the problem and answer in the space directly next to it. Please write the problem and answer. After you have written the problem and answer uncover it and check to see if what you wrote is correct. (Pause) Now, in the space next to the problem you just wrote, I want you to write the reciprocal fact (teacher will need to pre-teach what this is, terminology can be changed). Did you write the two correct problems from the fact family? If you have written a wrong problem and answer then cross it out and write in the correct problem or answer. Does you have any questions? (Pause).

4. Continue reading, "Now let's try the next family, it is (read problem & answer). Remember look at the family, make a problem from the family, say it to yourself, and then cover it. Next, write the problem and answer (Pause for students to complete the step). Lastly, uncover the problem to see if you did it correctly. When you have written the problem and answered it correctly then write the reciprocal problem. Go to the next family and complete these until you have finished the sheet.

5. If you have any questions, or are unsure of how to do Cover, Copy, and Compare then let me know and I we will go over the procedure again.

6. Repeat as necessary

This training script is generally successful for a majority of students. Continuously observe the student and provide performance feedback and reinforcement as necessary. If administering the MIND: Skill Remediation Units to a group of students or a class, cycle though the room to check for adherence to protocol. In addition, point out students who are doing the steps correctly and provide behavior specific praise for correctly implementing CCC steps.

Explicit Timing (ET)

Target Behavior

ET was designed to be used with both individual and groups of students who need to increase fluent responding when completing basic math facts (i.e., addition, subtraction, multiplication, division). This antecedent timing procedure is appropriate for students who accurately respond to fact problems but do so slowly. ET procedures were designed to increase rates of responding and consequently speed of responding to basic fact problems and works best when paired with performance feedback (e.g., self-graphing) and reward. While ET will primarily be used in elementary grades, older students with fluency deficiencies in basic fact skills can also benefit.

Materials

MIND: Skill Remediation Unit, Implementation Checklist (optional), Pencil, Timer (optional)

ET Procedures: Student

1. Student writes name and date at the top of the paper. If using self-graphing student marks on graph his/her previous days performance.

2. Student begins completing problems when teacher says start and stops when instructed to stop

Explicit Timing – Student Training Protocol

Use this to train students how to use ET procedures. This training script was written for a class-wide application; however, it should be fairly easy to adapt to either a small group or individual student. The steps are as follows:

1. Pass out the ET worksheets to students and instruct them to write their names at the top of the paper.

2. Read the following directions, "Today we are going to complete math worksheets using explicit timing. With explicit timing I am going to give you x minutes to complete as many problems as you can. Your first goal is to complete each problem correctly and to not skip around. In addition push yourself to work as quickly as possible".

    a. If using self-graphing add, "As you practice you should see your scores go up. To chart your performance you will be given a graph and each day before your math practice you will put your last score on the graph".

3. Are there any questions? Ok, let's practice.

4. Continue, "When I say 'Begin' start answering the problems on your worksheet. Start at the top and work across the page and then go to the next row. Try each problem and do not skip any problems. I am going to give you __ minutes to complete as many problems as you can. Are there any questions? Ready. Begin!

5. After x minutes goes by, stop students. Repeat as needed. When finished collect the ET worksheets.

6. This training script is generally successful for a majority of students. As you are reading the directions cycle through the class and provide student(s) with procedural feedback as needed and encourage students to do their best work.

Procedural Cover Copy Compare (P-CCC)

Target Behavior

Procedural Cover, Copy, & Compare (P-CCC) was designed to be used with students who can fluently complete basic fact skills (>40 DC/M) but are unable to complete multi-digit computation problems above 20 DC/M. This pattern of responding is indicative of a student who lacks the procedural skill set needed to apply his/her prior knowledge of fact skills. P-CCC is a multi-component intervention that incorporates teacher demonstration, guided practice using visual cues, independent practice, and performance feedback with re-teaching (if needed). This same instructional sequence can be used across all skills (i.e., +, -, x, ÷). The combination of these approaches integrates modeling, cueing, and feedback to encourage errorless learning but also fades supports so students independently apply and practice the taught procedural skills.

Materials

P-CCC Teacher Script w/ matched multi-digit computation probe, P-CCC Implementation Checklist, Pencil, Timer (optional)

P-CCC Procedures: Teacher

1. Select Skill (+, -, x, ÷) and obtain subskill worksheets for sets A, B, & C for that skill. Begin using the P-CCC intervention with set A, then set B, and lastly set C (move to next skill when student scores >20 DC/M w/ 90% ACC across 3 days).

Multi-Digit Computation Subskill Probes

	Skill	Set	Problem Type(s)	Time	Mastery
Multi-Digit Addition:	+	A	3+3 digit	2 min	20 DC/M
	+	B	2+1 digit w/ regrouping	2 min	20 DC/M
	+	C	3+3 digit w/ regrouping	2 min	20 DC/M
Multi-Digit Subtraction:	-	A	3-3 digit	2 min	20 DC/M
	-	B	2-1 digit w/ regrouping	2 min	20 DC/M
	-	C	3-3 digit w/ regrouping	2 min	20 DC/M
Multi-Digit Multiplication:	x	A	2x1 digit	2 min	20 DC/M
	x	B	4x2 digit	2 min	20 DC/M
	x	C	4x3 digit	2 min	20 DC/M
Multi-Digit Division:	÷	A	3÷1 digit no remainder	2 min	20 DC/M
	÷	B	3÷1 digit w/ remainder	2 min	20 DC/M
	÷	C	3÷1 digit w/ decimals	2 min	20 DC/M

2. Implement P-CCC intervention

    a. Have relevant materials organized and ready (P-CCC script & integrity checklist, multi-digit computation worksheets, & score key)

    b. Give student probe, document date, record start/end time.

    c. Read script to demonstrate procedures, model completion using visual cues.

        i. Scripts are included for each of the three subskills across +, -, x, & ÷.

    d. Have student complete problem and verbally describe procedures. Provide feedback as needed and repeat until student accurately completes problem.

    e. Have student complete problems containing visual cues.

        i. Provide behavior specific praise as needed.

    f. Have student complete remaining problems (no visual cues).

        i. Problems on second page will require student to discriminate when and when not to use the taught procedure (monitor carefully).

    g. After student finishes, present student with scoring key. Review completed probe and provide student with feedback on accuracy. Provide error correction & re-teaching as necessary.

        i. Progress monitor and incorporate self-graphing w/ reward as needed.

P-CCC Procedures: Student

1. Student records information on daily probe (name, date, start/end time).

2. Student watches and listens to teacher who completes the first problem, describes procedures, and defines the purpose of visual cues.

3. Student completes problem and verbally describes procedures to teacher w/ support of visual cues (teacher provides feedback and re-teaching as needed). Repeat as needed.

4. Student completes problems independent of teacher using visual cues.

5. Student completes problems independent of both teacher and visual cues & discriminates when and when not to use taught procedure.

6. Student receives feedback (teacher led review of score key) on accuracy of performance and corrects inaccurate problems using Step 2.

Step 4: Assess student with probe at the end of the intervention Unit.

The final step of the MIND is to assess the student at the conclusion of each intervention Unit to monitor progress and inform the next intervention step. To do this use the outlined CBM procedures to obtain a DC/M score. Document the student's DC/M score and match student performance to the recommended intervention Unit.

At the conclusion of each intervention Unit there will be a 3 step decision making guide that includes CBM procedures and a skill specific computation probe. You will be prompted to assess student performance using CBM procedures to obtain a DC/M score. You will record the score to determine what Unit to use next.

Post-Test Decision Example

Step 1: Using CBM procedures assess student using the probe on next page & document DC/M scores.

Step 2: Score & record student performance. _____ DC/M.

Step 3: Decide what packet the student needs to complete.

- If student performance is less than 19 DC/M then repeat Unit 1.11
- If student performance is between 20 – 40 DCPM then move to Unit 1.12
- If student performance is above 40 DCPM move to Unit 1.21

Tips for Success when Evaluating & Differentiating the MIND: Skill Remediation

1. Closely observe student behavior during daily lessons. The interventions of the MIND are packaged to promote errorless learning; therefore students should not be inaccurately responding or skipping problems. If this occurs remind the student to work each problem. Ensure that the student is focused and giving their best effort, if the student is not differentiate by providing additional feedback, praise, and/or reinforcement as needed.

2. Assess at the end of each Unit. The MIND was designed to appropriately place students by matching patterns in student responding (i.e., accuracy & fluency rates) to intervention. Once this is done and the student completes an intervention Unit a post test is given to evaluate student progress. It is critical that this is done and the student gives his/her best effort and does not skip problems to have a valid score to drive educational decision making.

3. Reacting to a lack of growth. If student progress is not meeting expected growth rates (preliminary estimates are 14-18 DC/M (+, x, ÷) and 8-12 DC/M (-) increases for each Unit) then it is recommended that the dose is doubled (distribute one in morning and one in afternoon) and the interventionist provides additional feedback, praise, and/or reinforcement.

Conclusion

The MIND: Skill Remediation packet is a standard protocol approach that was designed to provide educators with a supplemental resource to build computational proficiency in their students. We hope that this intervention manual was helpful in describing the rationale behind the intervention sequence and delineating how to implement these practices with your students. It is our hope that the resources – intervention overview, student training protocols, & the printable intervention Units – are both efficient and effective. It is our goal to provide educators and students empirically-validated instructional resources at minimal costs that result in positive student outcomes. Any feedback to improve our products or to inform us of perceived strengths and/or weaknesses is welcomed. Lastly, please feel free to contact us with any questions via email.

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