Best Practices for Promoting Math Achievement: Presenter Notes

Slide 2:

- Today we are going to focus on discussing the importance of family involvement
- We will be discussing specific strategies that if applied correctly can improve the school's approach to family friendly practices
- Finally we will discuss how these strategies impact our environment & how we can take steps towards improving partnerships with families in our schools.

_____
_____
_____
_____

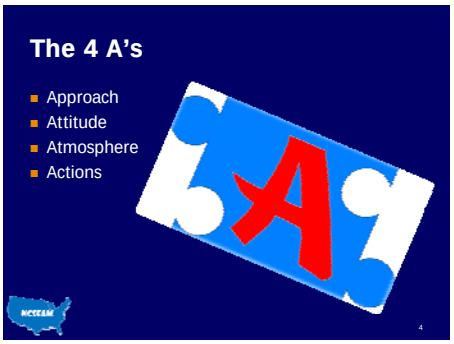
Slide 3:

- Review the definition of Indicator 8 of Part B of the Individuals with Disabilities Education Act (IDEA).
- Focus on the importance of involving families in the education process and strengthening partnerships between families and schools.
- Every state is responsible for taking positive steps to include families. The Department of Education monitors parents perception of how well schools reach out to families and how this improves services for their students.

_____
_____
_____
_____

Slide 4: The 4 A's

* More information is contained in the PowerPoint presentation at the end of this document*



- For flourishing family-school partnerships to occur, certain condition should be met.
    - These include:
        - An *approach* that invites and expects family involvement
        - Positive *attitudes* educators hold regarding family involvement
        - A welcoming *atmosphere* created by educators.
        - Once these conditions are in place, effective family-school partnerships can take place (*actions*).

_____
_____
_____
_____

Slide 5:

- Discuss how the approach, attitude and atmosphere must be appropriate **before** parent friendly "action" can be taken. Conduct a discussion with the audience of suggestions of how these areas can be improved within your school environment.

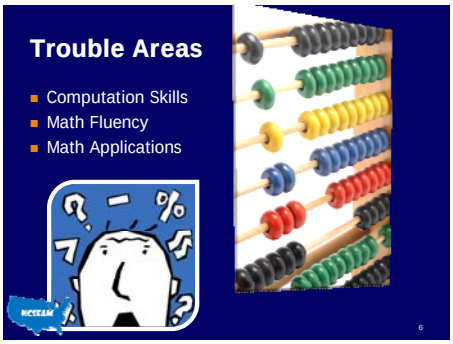
  This is a schematic to better understand how the 4 A's connect.

_____
_____
_____
_____

Slide 6:

- Parents can make a difference in a child's academic performance including math.

- Areas your student may struggle with in math:
  - Computation skills - trouble correctly solving addition, subtraction, multiplication, division problems
  - Math facts fluency - unable to do simple math problems automatically, instead often has to count on fingers
  - Math applications - trouble with applications such as money, measurement, time, word problems



_____
_____
_____
_____

Slide 7:

- When working with child at home, be sure to:
  - Praise effort, not answers
  - Use additional motivators as necessary, such as rewards from reward menu
  - Keep total length of time reasonable, and stop when the child seems tired

_____
_____
_____
_____

Slide 8:

- Highlight that these are math interventions parents can do at home:
  - Interspersing Techniques
  - Explicit Timing
  - Cover, Copy, Compare

_____
_____
_____
_____

Slide 9: Refer to Handout 1

- Complete academic tasks- Focus on increasing students' desire to complete academic tasks while keeping the curriculum standards. This technique involves alternating the order in which both difficult and easy academic tasks are presented to the student. This can be done with worksheets and/or flashcards
- Worksheets
  - Can have mostly items a student already knows well and a few items that are more difficult
  - As the student progresses the ratio of difficult to easy items may be increased
- Flashcards
  - Start by having a majority of math facts flashcards that the student knows really well, and mix in some of the more difficult flashcards
  - As the student is able to learn the difficult math facts, more difficult flashcards are gradually added

_____
_____
_____
_____

Slide 10: Handout 2

- Fluency- Helps with fluency of math facts
- Materials
    - Stopwatch or watch with second hand
    - Kitchen timer with bell
    - Sets of math worksheets with 100 basic math problems on front of sheet (addition, subtraction, etc) stapled together into a packet
    - Pencil

_____
_____
_____
_____

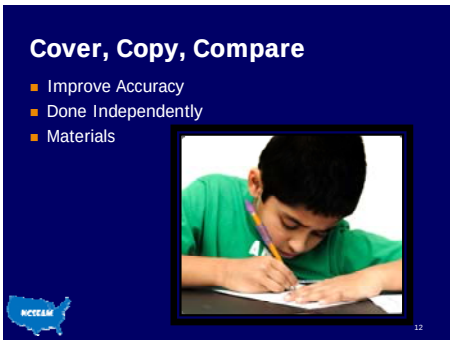
Slide 11:

- Procedure
    - Set kitchen timer for period of time (10 minutes, 15 minutes, etc)
    - Use stopwatch to time 1-minute intervals during the period
    - At beginning of each timing, say: “Pencil up, ready, begin!”
    - At end of 1-minute interval, say “Stop!” and have student draw line after last problem answered. Repeat until kitchen timer goes off.
    - Have student correct the worksheets and keep track of number of problems correct
- Evaluation
    - Calculate average #correct per minute – count the total # of problems correct for the period and divide by the number of 1-minute intervals
    - Compare average #correct/minute over time to evaluate if the student is becoming more fluent (faster)
    - Have student do 3-5 times per week

_____
_____
_____
_____

Slide 12: Refer to Handout 3 and 4

- Improve Accuracy-Helps improve accuracy and speed with basic math facts
- Done Independently-Can be done independently by students once they know the procedure
- Materials:
    - Training sheets with 10 math problems and answers listed down the left side
    - Index card
    - Pencil



_____
_____
_____
_____

Slide 13:

- Procedure
    - Student silently reads the first problem and answer on training sheet
    - **Cover** the problem and answer with index card
    - **Copy** - write the problem and answer from memory on right side of page
    - **Compare** - uncover problem and answer and compare the two problems
- Evaluation
    - If correct answer, go on to next problem
    - If incorrect repeat procedure with the problem until correct before moving on to next problem
    - Have student do 3-5 times per week

_____
_____
_____
_____

Slide 14

- Explain that this intervention takes place in school but relies on parental involvement
- Explain that these are some of the components of the intervention but the next slides discuss the intervention more in depth

Slide 15: Refer to Handouts 5-10

- Parent Involvement
  - Parents can be involved at several levels based on what fits their schedules and comfort level
  - They select which activities they would like to participate in
  - Specific activities for parents:
    - Provide home-rewards for math performance in RPT
    - Attend classroom sessions to observe their child doing RPT
    - Can be "assistants" who help out in the classroom during the RPT sessions – e.g., answer questions, help with timing
- Materials
  - Introductory Parent Letter (Handout 6)-Gives an overview of process and provides contact information if there are questions
  - Ideas for home rewards list (Handout 7)
  - School Reward Menu (Handout 8)- This is an example. It is important that your students have a part in selecting the rewards.
  - Team Score Cards- This can be a plain sheet of paper. You should have one per pair of students per week
  - Stickers for the team score cards
  - Problem drill sheets- 16 problems with one per student per session
  - Flash cards- One set of cards per pair. Problems need to be on the front and computational steps plus answers on the back
  - Student Try sheet (Handout 9)
  - Reward Certificate (Handout 10)

Slide 16:

- Introductory Procedures
  - Student Overview- Let students know they will be working in teams to help each other learn math and that their parents will be invited to give them rewards at home (See Math Handout 6 for sample home rewards for parents)
  - Send Parent Letter- Send parent letter home with students inviting them to be involved
  - Divide into pairs- Divide the students into pairs who are at about the same math skill level

_____
_____
_____
_____

Slide 17:

- Each Week
  - Choose Reward- The teacher needs to have each pair choose a school reward from the menu
  - Meet with team- Meet with each team to help them set a realistic team goal (total number of math problems they can solve correctly as a team) for the week
  - Determine individual goals- Have each student determine an individual goal (added together should equal the team goal) and record the individual goals, team goal, and chosen reward on Team Score Card

_____
_____
_____
_____

Slide 18:

- Each Session
  - Flash Cards
    - Teacher or Parent Assistants: Give each pair a set of flash cards
    - Pairs decide who will be "teacher" first
    - Teacher" holds up flash cards for student who works the problem on worksheet section marked "Try 1"
  - Correct/Incorrect Answers
    - If correct "teacher" praises student and holds up next flash card; if incorrect "teacher" gives instructional prompts from solution on back of flash card and student re-works it in section marked "Try 2."
    - If correct, move on to next problem. If incorrect again, "teacher" works the problem in section marked "Help," explains each step, and answers the student's questions as they go. Then student works the problem again in "Try 3." If the "teacher" is unable to answer the student's questions, the classroom teacher or a parent assistant can help.
  - Switch Roles
    - After 10 minutes, "teacher" and student switch roles

_____
_____
_____
_____

Slide 19:

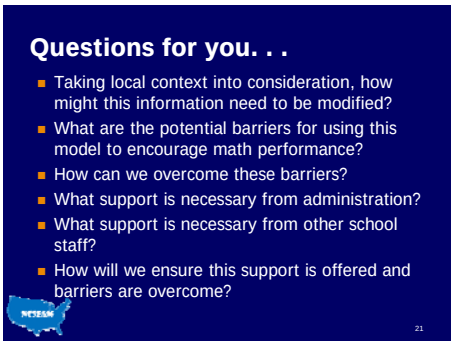
- After Each Session
  - Teacher or Parent Assistants- Give problem drill sheet to each student and have students work on them individually for set period of time (such as 7 to 10 minutes)
  - Correct/Incorrect Answers
    - Have pairs switch papers and correct them
    - Pairs count the number of problems each member answered correctly and add together to get the team score
    - Compare team score to team goal – students "win" if goal is met, if so give students a sticker to put on their score cards
  - Reward
    - Give students their chosen reward after 3 wins
    - Send reward certificate home to parents
    - Parents sign certificate and indicate what reward they gave (if any) and any additional comments
    - Remind students to return certificate

_____
_____
_____
_____

Slide 20

- Discussion points for your school staff

_____
_____
_____
_____



The 4 A's:
Creating Conditions for Family-School Partnerships

The Future of School Psychology Task Force on Family-School Partnerships

Susan Sheridan, Jenny Burt, Ashley Taylor, Andy Garbacz, Katie Black, Katie Magee, Laura Mullaney, Katie Hraban, Kelly Rasmussen

Nebraska Center for Research on Children, Youth, Families and Schools
University of Nebraska-Lincoln

The Four A's

- Certain attitudes and beliefs need to be in place before any family-school intervention can be effective
- Four A's (Approach, Attitudes, Atmosphere, and Actions) define the conditions that are necessary for effective family-school partnerships

Developing Pathways to Partnerships

Prerequisite Conditions:
These "3 A's" must be in place for Actions to be accepted and effective

(Christenson & Sheridan, 2001; Sheridan & Kratochwill, 2008)

Approach

Approach: The framework for engaging in positive interactions with families

- *Belief in shared responsibility* is central to family-school partnerships
- *Both families and educators are essential* for children's growth and development
- Emphasis placed on *relationships* between family members and educators, rather than on separate roles that each assume

Approach

- How To Engage in a Partnership Approach:
  - Request parental assistance – create opportunities for dialogue and empowering parents
  - Encourage a role for parents – share information and resources to solve concerns
  - Provide rationales and expectations for families and schools to work together
  - Structure interventions that require cooperation and communication (e.g., home-school notes, home reinforcement for school performance)
  - Increase responsibility for successful outcomes by including all participants (parents, teachers, and child when appropriate)

Attitude

Attitude: The values and perceptions held about family-school relationships

Includes attitudes that:

- All families have strengths.
- Parents can help their children succeed in school -- they must be provided with the opportunity and necessary information and support.
- Parents have important information and perspectives that we need to help educate their children.
- Parents and educators each bring unique and important perspectives and expertise to the table as co-equals.

Attitude

- How To Adopt a Partnership Attitude:
  - Attempt to take parents' perspectives whenever possible.
  - Ask yourself:
    - Do I put myself in the parents' place and mentally reverse roles to consider how I would feel as the parent of the child about whom there are concerns?
    - Do I really believe that parents are equal to me as a professional and are experts on their child?
    - Do I consistently value the comments and insights of parents and make use of their reservoir of knowledge about the child's total needs and activities?
    - Do I listen to parents, communicating with words, eye-contact, and posture that I respect and value their insights?
    - If I had a child in this situation, what information would I want and how would I like to be treated?

Atmosphere

Atmosphere: The climate in schools for families and educators to engage as partners.

- The affective climate in interactions among families and schools.
- The physical climate in schools that make them inviting and "family-friendly."
- All families must feel welcome!
  - Differences in parent backgrounds & experiences must be recognized.
  - Personal difficulties in school or previous conflicts may be prominent.
  - Ethnic, linguistic, religious, class differences can widen the gap.

Atmosphere

- How To Create an Inviting Atmosphere:
  - Recognize and appreciate diverse family structures, circumstances, and responsibilities, and how they may impact roles
  - Make your classroom welcoming and family-friendly
  - Spend time getting to know families and developing on-going relationships
  - Refrain from making assumptions and generalizations about families

Actions

Actions: What schools do to build partnerships and shared responsibility for education with families through effective communication.

- There is no one-size fits all approach
- Examine your current practices for partnering with families, and your willingness to include families and ask for their input
- Effective communication and administrative support are *key!*

Actions: Communication

- How To Practice Effective Communication:
  - Provide regular information to parents about their child's progress (e.g., make "good news" phone calls; use home-school notes; share information through e-mails, weekly folders, newsletters)
  - Engage in effective conflict management strategies by using clarifying statements and problem-solving strategies
  - Use words that convey a partnership (e.g., "we, us, and our" versus "you, I, yours, and mine")
  - Share information about how families can help their child at home

Actions: Communication

- How To Practice Effective Communication:
  - Use statements that express concern for the child
  - Retain focus on the child's goals and how to achieve them together
  - Elicit ideas, information, and perspectives from parents using open-ended questions (e.g., "How?" "When?" "Describe")
  - Paraphrase and validate message from parents to check understanding (e.g., "I hear you saying…"; "You are concerned about…")

Actions: Administrative Support

- Establish policies for partnering with all families
- Include policies for:
  - Requesting parental input throughout all phases of decision-making, not just when problems arise
  - Participation of parents who lack literacy skills or do not speak English
  - Professional development for teachers and staff to enhance their effectiveness with parents
  - Opportunities for parents to assist in the instructional process at school and at home

Key Points to Remember

- The development of effective approach, attitude, atmosphere and actions takes time.
- The aforementioned strategies may not work equally for all students, families, and educators.
- Individual schools may want to discuss what type(s) of programs will best meet their needs and school communities.
- Committing the time and resources while developing and implementing effective strategies will allow the process and outcomes to be most effective.

Evidence-Based Family-School Math Interventions

What we know…

Model: Interspersing Technique

Goals:

- Promote student's mathematic abilities

Description:

- Focus on increasing students' desire to complete academic tasks while keeping the curriculum standards
- Involves alternating the order in which both difficult and easy academic tasks are presented to the student
- Can be done with worksheets and/or flashcards

Intervention Procedures:

- Worksheets
    - Include mostly items a student already knows well and a few items that are more difficult
    - As the student progresses, the ratio of difficult to easy items may be increased
- Flashcards
    - Start by having a majority of math facts flashcards that the student knows well, and mix in some of the more difficult flashcards
    - As the student is able to learn the difficult math facts, more difficult flashcards are gradually added

Methodological Rigor:

- Randomization
- Control or comparison assessments and assignments utilized
- Appropriate unit of analysis
- Educational-clinical significance of change assessed
- Measures support primary outcomes
- Formal assessments utilized as outcome measures
- Research conducted in natural environments

Results:

- Students demonstrate increased preference for assignments, completing assignments of greater length and increased difficulty
- Technique has been found to be effective for regular and special education students
- Utilization of interspersing math items significantly increased the amount of time students remained on-task while completing worksheets

Selected References:

Calderhead, W. J., Filter, K. J., & Albin, R. W. (2006). An investigation of incremental effects of interspersing math items on task-related behavior. *Journal of Behavioral Education, 15*, 53-67.

Cates, G. L., & Erkfritz, K., N. (2007). Effects of interspersing rates on students performance on and preferences for mathematics assignments: Testing the discrete task completion hypothesis

Robinson, S. L., & Skinner, C. H. (2002). Interspersing additional easier items to enhance mathematics performance on subtests requiring different task demands. *School Psychology Quarterly, 17*, 191-205.

What we don't know…

- Long-term outcomes
- Effectiveness with a culturally and linguistically diverse population
- Results of a similar type of program targeting other academic areas
- Results of technique implementation with larger sample size

Evidence-Based Family-School Math Interventions

What we know…

Model: Explicit Timing

Goals:

- Enhance student's fluency abilities related to basic math facts

Description:

- The intervention utilizes 30 minute trials to assist students to become more automatic in math facts and more skilled in solving math problems. Intervention is easy to implement.

Intervention Procedures:

- Materials
  - Stopwatch or watch with second hand
  - Kitchen timer with bell
  - Sets of math worksheets with 100 basic math problems on front of sheet (addition, subtraction, etc) stapled together into a packet
  - Pencil

- Set kitchen timer for period of time (10 minutes, 15 minutes, etc)
- Use stopwatch to time 1-minute intervals during the period
- At beginning of each timing, say: "Pencil up, ready, begin!"
- At end of 1-minute interval, say "Stop!" and have student draw line after last problem answered. Repeat until kitchen timer goes off.
- Have student correct the worksheets and keep track of number of problems correct

- Calculate average #correct per minute – count the total # of problems correct for the period and divide by the number of 1-minute intervals
- Compare average #correct/minute over time to evaluate if the student is becoming more fluent (faster)
- Have student do 3-5 times per week

- **Methodological Rigor:**
- Multiple baseline used across subjects
- Appropriate unit of analysis
- Research conducted in natural environment
- Reliable outcome measures
- High inter-rater reliability

Results:

- The utilization of explicit timing increased the rate of problems worked correctly per minute
- Similar results were found with use of intervention in other subject areas including writing
- Intervention tends to make performance change more observable for students

Selected References:

Van Houten, R., & Thompson, C. (1976). The effects of explicit timing on math performance. *Journal of Applied Behavior Analysis, 9*, 227-230.

What we don't know…

- Long-term outcomes of intervention implementation
- Effectiveness with a culturally and linguistically diverse population
- Results of technique implementation with larger sample size

Evidence-Based Family-School Math Interventions

What we know…

Model: Cover, Copy, and Compare

Goal:

- To improve accuracy and speed with basic math facts

Description:

- Students learn a five-step process that increases the opportunities to solve math problems and evaluate their answers
- It is an efficient strategy to improve fluency which requires little training or time from the teacher

Intervention Procedures:

- Student silently reads the first problem and answer on training sheet
- Cover the problem and answer with index card
- Copy - write the problem and answer from memory on right side of page
- Compare - uncover problem and answer and compare the two problems
- Evaluation
    - If correct answer, go on to next problem
    - If incorrect repeat procedure with the problem until correct before moving on to next problem
- Have student do 3-5 times per week

Methodological Rigor:

- Within-subjects multiple baseline design
- Appropriate unit of analysis
- Reliable outcome measures
- High interobserver agreement
- High treatment integrity
- Program components documented
- Research conducted in natural environment

Results:

- When compared:
  - All students demonstrated increased fluency and accuracy
  - Weekly maintenance assessments showed that the students were able to maintain these gains over time

Selected Reference:

Skinner, C. H., Turco, T. L., Beatty, K. L., & Rasavage, C. (1989). Cover, copy, and compare: A method for increasing multiplication performance. *School Psychology Review, 18,* 412-420.

What we don't know…

- Components linked to primary outcomes
- Cost-benefit analysis of program
- Results of techniques used with larger sample sizes
- Effectiveness with culturally and linguistically diverse population
- Whether positive effects are maintained beyond several weeks

Evidence-Based Family-School Math Interventions

What we know…

Model: Reciprocal Peer Tutoring (RPT) and Parent Involvement (PI)

Goal:

- Promote ***mathematics achievement*** of at-risk students

Description:

- "RPT is a collaborative learning method designed to combine the components of group reward contingencies and peer teaching" (Heller & Fantuzzo, 1993, p. 518)

Intervention Procedures:

- RPT
  - Students are divided into pairs with one student as a "teacher" and the other as a "student;" roles switched after 10 minutes
  - Students complete drill worksheets and flashcard computations with the "teacher" providing feedback, prompting, and coaching, and the "student" answering the questions
  - The pair receives a score, which is compared to a goal; rewards are administered when the goal is met
- PI
  - Parent involvement is individualized and includes: (1) rewards/incentives provided by parent, (2) parent visits to child's classroom, or (3) parents serving as classroom volunteers
  - Child brings home "reward certificates" to inform parents of his or her school performance and reward status; parents sign the certificate, indicate the type of reward provided at home, and the child returns it to school

Methodological Rigor:

- Randomization
- Control-comparison group
- Equivalent mortality with low attrition
- Appropriate unit of analysis
- Sufficiently large N (N=84)
- Multiple assessment methods
- Group equivalence established
- Educational-clinical significance of change assessed
- Program components documented
- Interventions manualized
- Validity of measures reported
- Null findings reported
- Program components linked to primary outcomes
- Measures support primary outcomes
- Implementation fidelity
- Site of implementation

Results:

- RPT + PI produced higher rates of accurate mathematics answers on curriculum-based measurement, significantly higher standardized computation scores, and higher ratings of positive academic and social behaviors
- Students were rated by teachers as improving in their learning skills (e.g., work habits and motivation) and described as less disruptive, more task-oriented, and more interpersonally confident
- Effect sizes range from 0.86 – 1.63 (Fishel & Ramirez, 2005)

Selected References:

Fishel, M. & Ramirez, L. (2005). Evidence-based parent involvement interventions with school-aged children.
School Psychology Quarterly, 20, 371-402.

Heller, L. R. & Fantuzzo, J. W. (1993). Reciprocal peer tutoring and parent partnership: Does parent involvement make a difference? *School Psychology Review, 22*, 517-534.

What we don't know…

- Outcome effects with diverse populations, including middle to upper SES
- Effect of parental involvement achievement independent of RPT