Early Math for School Readiness Kids Play Math: An Overview
Front Porch Series Broadcast Calls

Gail Joseph: Well, Happy Monday, and welcome to another installment of the NCQTL Front Porch Series. I'm Gail Joseph, and on behalf of my colleagues at the National Center on Quality Teaching and Learning, I'd like to thank all of you for joining us today, this Monday after Thanksgiving. For those of you joining us for the first time, the goal of the Front Porch Series is to feature national experts who are doing innovative applied work to improve the quality of teaching and learning, and in turn, the outcomes for young children and their families. And I'm so happy to say that today's featured speakers embody this goal.

Today we are joined by Dr. Jeff Farmer and Jenny Lerner as well as Dr. Alvaro Arias. Dr. Farmer is a Research Professor at the University of Denver who has provided professional development to teachers from pre-K to college – I love that – in the area of math and mathematical teaching. And also joining today is Jenny Lerner, who has over 20 years' experience working for national, migrant, regional and local Head Start programs in the areas of early math, early literacy and dual language. Together they will be presenting their work: Kids Play Math. This work was developed with an Office of Head Start Innovation and Improvement grant. I personally have been really looking forward to learning more about this innovative work.

But before I turn it over to our esteemed speakers, I want to remind you that, as always, we'll save a few minutes at the end to field your questions, but feel free to send these in using the question bar at any point during the presentation. In fact, we already have a couple questions coming in. And one more quick detail: Today is a little bit different. We're actually breaking some virtual ground, if you will, by showing a bit of video during today's broadcast conference call. Sometimes this works, and sometimes it doesn't. And if it doesn't, if we experience any technical problems, please don't leave our webinar, because our speakers are prepared with a plan B to switch over to more of the traditional PowerPoint presentation. So just know that if any glitches happen, we've got some backup plans to go from. So without further ado, I'm going to turn this over to our presenters today.

Jeff Farmer: Welcome to the Kids Play Math webinar. Thank you for attending. Kids Play Math includes computer games and teacher professional development in early mathematics for Head Start. Watch this video introducing the project and the professional development course.

Woman: Introducing Kids Play Math! Welcome to your online training course!

Mario Lopez: Hello, my name is Mario Lopez. I'm a Professor of Mathematics and Computer science at the University of Denver. Welcome to Kids Play Math. This video will introduce you to the Kids Play Math program and the online training course.

Kids Play Math is a three-year innovation and improvement project in the mathematics department at the University of Denver. The project is funded by the Department of Health and Human Services through the Office of Head Start. We have assembled a multidisciplinary team comprised of people from mathematics, computer science, math education and early childhood professional development. We created Kids Play Math to help Head Start children succeed in mathematics and reduce the achievement gap between Head Start children and middle class children. Kids Play Math also includes a teacher support system. The project addresses the relevant parts of the Child Development and Early Learning

Framework. It supports children who speak either English or Spanish. It also supports teachers in instruction and assessment of mathematics.

How do we accomplish this? Kids Play Math computer games are really different. In each of these games there are many, and I mean many, different kinds of math activities. The program keeps track of each child's progress no matter which game the child chooses to play. The program will give children activities that are at their own level in every game. The games include many activities such as comparison, counting, matching shapes or placing them in a puzzle. The games use many different ways of showing number, like dice or fingers, and include some spatial sense activities. As you can see, these activities cover important early mathematics areas like numeracy and geometry as well as spatial sense.

Jeff Farmer: Hola, I'm Jeff Farmer. I'm in the mathematics department at the University of Denver, and I will be one of the instructors for your course. This is the learning cycle for the online training course. The Kids Play Math online training course is designed for teaching staff: teachers, classroom assistants, home providers, education coordinators, and supervisors; people who have access to classrooms and are currently teaching children. In this course, you will learn about the Kids Play Math games. You will learn how the games work, how the children can play them individually, and how you can play them as a teacher with a small group of children, engaging children in conversation and helping them with concept development. The course will also integrate discussions of early mathematics. You will learn some of the important facts about early math research and early math learning. In addition, in this course, we will show you and share with you many ideas for classroom activities that can support math learning. These activities are not related to computers, but they are related to early math, and they'll be very important for helping your children learn. Finally, the most important part of the course is the homework. This is where you will go back to your classroom and apply what you have learned by watching the videos and reading the handouts.

In your classroom, you will work with children on many mathematics concepts. The topics we will cover are aligned well with the Child Development and Early Learning Framework. In mathematics knowledge and skills, we will look at number concepts and quantities, number relations and operations, geometry and spatial sense, and comparison. In the area of logic and reasoning, we will work on problem solving and on symbolic representations. One of the most important aspects of this course is that we will ask you to play the computer games with your children in a small group setting. During these times, you will be interacting with the children and having important conversations about mathematics with them. This will happen in almost every homework assignment. It's the most important part of the homework. Be sure to remember this.

Jenny Lerner: Hola, I'm Jenny Lerner, an early childhood and Head Start specialist. I will also be one of your instructors in this course. This course will help you to integrate Kids Play Math in the daily routine of the classroom: in the large group and small group settings, in child-initiated activities, in transitions and work with families, regardless of the curriculum you're currently using. In these areas, you will learn how to expand and improve the kind of conversations that you have with children about mathematics. The skills we will teach are consistent with high indicators on the CLASS assessment.

Learning about the Kids Play Math game is an important part of the course. You will install these games on your classroom computer, and your children will play them. All children should have the opportunity to play the games individually or in pairs by themselves during child-initiated activities. One of the most important parts of the implementation is for teachers to make time to play the computer games together with a small group of children and ask extension questions to support concept development.

This can take place during small group time or during center time, for example. By the end of this course, teachers will be able to use the Kids Play Math games as a tool in your classroom, have high-level conversations with small groups of children about math, have learned specific ways you can work with children and their families on math, and integrate math into all areas of your classroom.

Alvaro Arias: Hi, I'm Alvaro Arias. I'm a professor of mathematics at the University of Denver. Let's talk about how to take an online course. How is an online course different? An online course requires a few computer skills and some familiarity with how to use the Internet. If you need support in this area, we encourage you to work with someone else who has more computer experience than you do or that you ask your local technology person for support. An online course also requires that students take initiative. What are the advantages of an online course? You get to decide when, where and how you will watch the videos. You may decide to watch the videos several times in order to really understand the material. We encourage you to do this.

Our course is user-friendly for teachers. Much of the learning will take place as you do the homework in your own classroom. Every lesson has: an overview of the topic, videos explaining a few early math concepts, videos explaining and showing activities that you can do with the Kids Play Math games, videos explaining and showing activities you can do in your classroom, an opportunity to play the Kids Play Math games, homework assignments. These are the most important part of the course, and this is where you will learn the most – in your own classroom. A discussion forum where you can post some comments that your colleagues can read and then respond to. At the end of the course you will receive a portfolio with all your handouts and homework. Be sure to complete all the assignments, because your grade in the course will be based on the portfolio and the quizzes you take. The course will probably take you about two to three months to complete. Thank you for your participation. Enjoy the course.

Jenny Lerner: Kids Play Math was created to enhance mathematics learning in Head Start classrooms. Math is important for future learning. Numerous studies show that children's math skills when entering kindergarten are the best predictor of, or as good a predictor of, 5th grade academic success in both mathematics and literacy. Our objective was to reduce the gap between Head Start children and middle class children in school readiness and math. There are several important elements in Kids Play Math. They include flexible computer games for children. The games are bilingual, in Spanish and English. The software tracks children's progress. The mathematics activities address the major areas in math and in the Child Development and Early Learning Framework. The program includes resources for teachers, such as reports on game play and a special teacher mode for use with small groups of children. Importantly, we also provide professional development in early mathematics to Head Start teachers so they can understand the learning trajectories for math concepts, how to work with small groups on concept development, obtain classroom activities to integrate into all areas of instruction, implement homework assignments in their own classrooms.

Why computer games? Preschool instruction focuses on integrating all content into play, routines and child-initiated activities. Playing math games can reduce or eliminate the early math achievement gap. Computer games can engage children's attention and provide teachers with an important instructional tool. Existing software tends to be rigid, lacks good assessment and reporting capabilities, and it is not integrated into the classroom instruction.

Jeff Farmer: There is important research about preschool teachers' professional development needs. Pre-K teachers spend on average less than 7% of time each day teaching math. Much research about early math learning is very new, since 2000, and most is not known by many teachers. For example,

researchers find that working in depth with smaller numbers first is much more effective than just counting to larger numbers, like 17 or 26. Many teachers work mostly on counting. Also, teachers have had little or no preparation in integrating early math concepts into their instruction and their work with families. The Kids Play Math program supports teachers to integrate math into all areas of classroom instruction, as well as work with families and assessment.

Kids Play Math games include many mathematics activities, such as identifying numbers by hearing the number word; identifying number representations; counting, comparing and adding sets and subsets. They also include addition and comparison activities moving through learning trajectories. Finally, Kids Play Math activities include geometry, such as assembling and disassembling shapes and identifying names, and spatial sense – for example, moving around and identifying positions on a grid. The Kids Play Math games support counting and identifying numbers, starting with smaller numbers and proceeding to larger numbers. They are implemented in several different games. Representations up to 10 include fingers, five frames, dice dots and numerals, and these can be mixed. For numbers from 11 to 20, the numeral and the 10-frame representations are used.

We performed a pilot study on the implementation of the Kids Play Math games. We worked with teachers from urban, small town and migrant programs. One important result was that children loved the games. In addition, in the classrooms where teachers used the program fully, including working with small groups, the children achieved significantly more in math. The gains were comparable to those obtained by other interventions that are much more extensive and costly. In addition, teachers said that the training helped them understand and teach early math better. This math learning will support greater achievement for Head Start children for many years to come.

Alvaro Alias: When the Kids Play Math screen opens up, the kid uses his or her avatar. Then he clicks on the password, which is the name, and he or she goes to the fair.

GAME CHARACTER: Welcome! Bienvenido! Choose a booth to play.

Alvaro Alias: In the fair, the kid chooses a booth, and the software chooses a math activity that is at the right level of difficulty.

GAME CHARACTER: Mousy wants to eat the cheese. Click on red. Choose two. Froggy wants to eat the fly. Choose two.

Alvaro Alias: The activities will range from simple ones appropriate for 3-year-old kids to advanced ones that will challenge 5-year-old ones.

GAME CHARACTER: Click on a blue lily pad.
[frog croaks]
[music plays]

GAME CHARACTER: Click on a small animal. How many pieces of cheese do you see? Click on blue. Yay! Click on orange. How many pieces of cheese are there? How many birds are there? Look, one bird is going to the house. Look, four more birds are going to the house. How many birds are there in the house now? Very good. Which group has more birds? The orange birds or the red birds or the yellow birds? Excellent. And now, how many monkeys do you see? Yay!

Alvaro Alias: At the end of each game, there is a nice animation.

[GAME CHARACTER gives instructions in Spanish]
[frog croaks]

GAME CHARACTER: Muy bien! The little bee wants to drink the juice from the flower. Use the arrows to help the bee move to the flower.
[bee buzzes]

GAME CHARACTER: Very good.
[sucks from straw]

GAME CHARACTER: How many blue pieces of cheese are there? Good job! Click on a triangle. Yay!Choose a circle. Choose a parallelogram. Click on a triangle. Very good.
[sniffs]

GAME CHARACTER: How many horses are there?
[music plays]

GAME CHARACTER: How many squirrels? Very good.

Alvaro Alias: The Kids Play Math software is specially designed for the Pre-K classroom. The software provides individual and group reports, and the games can be played in kids mode and teacher mode.

GAME CHARACTER: Welcome! Bienvenido! Choose a booth to play.

Alvaro Alias: The interface of the teacher mode allows the teacher to select any activity and any level supported by the booth. This is ideal for small group activities.

GAME CHARACTER: Choose a shape and put it in the puzzle. You picked a triangle.

Alvaro Alias: Teachers can easily produce reports. They click on a kid, individual report. They choose family report or teacher report, select age, select the standards -- new Head Start outcomes, Creative Curriculum, for example -- and generate the report. The software presents more than 300 math activities that follow the most recent research on learning trajectories. The activities are organized by our unique graph that is designed to present the activities at the right level to optimize learning and produce detailed reports.

GAME CHARACTER: Welcome! Bienvenido! Choose a booth to play.

Jeff Farmer: How the Kids Play Math course supports deep learning of mathematics. We have already seen the four elements that are included in the online course: orientation to Kids Play Math games and how to most effectively use them; a basic understanding of early mathematics teaching and learning; activities to integrate into all areas of instruction; and homework that takes place almost exclusively in teachers' own classrooms, where they apply what they have learned.

Let's see how each of these supports concept development in mathematics, using high-quality feedback. A unique aspect of the Kids Play Math games is that they are designed to be used by the teacher to play

with small groups of children, asking extension questions and engaging children in deeper conversations about mathematics. Understanding the learning trajectories for early mathematics concepts helps teachers assess the children's progress and know what kinds of activities will help them take their next steps in learning. Using activities that are more consistent with research in all areas of instruction will increase children's understanding of math concepts and their progress toward school readiness. Practicing what they have learned in their own classrooms will allow them to internalize the concepts and skills so that they can continue to support math learning for all their future students.

The course consists of 10 content modules and two review modules. Each content module supports topics from the Child Development and Early Learning Framework and deeper mathematics learning. The topics include two major areas of early mathematics: numeracy, which researchers say should involve about 60% of math instruction, and which is sometimes neglected; and geometry and spatial sense, which should comprise 40% of preschool math instruction. Each module supports high-quality instruction in mathematics in a variety of ways, from learning about early math research and practicing assessment procedures, to using Kids Play Math games for concept development, to viewing video examples of how research-based mathematics activities that have been shown to improve math learning for low-income children can be used. Watch this video from the online course that demonstrates these elements.

Jenny Lerner: In Head Start programs, CLASS is used as a tool to assess the interaction between teachers and children in the classroom. Many aspects of math fit perfectly with CLASS. In particular, the dimensions of concept development and quality feedback. To provide the rich concept development and quality feedback in math, it is necessary to understand how children learn mathematics. We also need to know the learning trajectories to extend concepts and ask questions. Throughout this course, we will continue to study these concepts. We should pay special attention to the counting learning trajectories that we just reviewed. In math, children should always explain their answers, whether they are right or wrong. Teachers should take advantage of every opportunity to ask questions, to extend concepts and to have rich conversations back and forth with the children. Because of this, mathematics fits very well with CLASS.

I have extensive experience doing observation in Head Start classrooms, and I have noticed that in math, teachers often give very brief feedback responses to the children, and the conversation ends quickly. As you probably know, this will give you a low score in quality of feedback in the class assessment. Let me give you an example. The teacher asks, "How many blocks do you see?" Kid 1 says, "I see four." Kid 2 says, "I see five." Teachers often say to Kid 1, "No, there are five blocks." Sometimes the teacher goes a bit farther and counts the blocks for the child. However, in either case, the conversation ends. There are no questions or extension or back-and-forth feedback. The feedback for Kid 2 is often worse. Teachers usually say, "Yes, you are correct. Very good." And the conversation ends. Like before, there are no questions or extensions or back-and-forth feedback. A better feedback could have been asking to both children, "Are you sure? How do you know?" And if you have two children, you can ask them, "Do you agree?"

Here are some extensions that you can provide based on their answers. For Kid 1, you can ask him to count fewer objects or you can suggest to organize the objects in a line and then count them again. What you ask depends on your knowledge of the kid. For Kid 2, you can ask her to count more objects, or better yet, you can use the learning trajectory and ask deeper questions, like putting the five blocks far away from each other and ask her to count again. Or you can ask her what may happen if you put one more block in the pile. In this example, we show how in math it is always important to ask

questions, to extend the concepts and to have rich feedback conversation with the children all the time. As you can see, this fits perfectly with the CLASS. Watch the video and pay attention to the extension questions that are being asked.

[Video begins]
Adult: Yay, we're so happy! We're going to Artie's party to eat cake and pizza! Count how many are here to go to the party now.
Child: One, two, three, four, five, six, seven.
Adult: How many?
Child: Seven!
Adult: Are you sure there's seven?
Child: No.
Adult: No? Count them again then.
Child: One, two, three, four, five, six, seven.
Adult: How many yellow ones?
Child: Two.
Adult: Two yellow ones? Okay. How many are here?
Child: Thr...ee!
Adult: Three. Are you sure?
Child: Yeah.
Adult: Show me a three with your fingers. Are there three there?
Child: Yeah.
Adult: Okay. How many do we have here already?
Child: Two...three!
Adult: Are you sure? Count them.
Child: One, two, three.
Adult: Okay, so there is three. Remember?
Child: Yeah.
Adult: There is three. Now I'm going to hide them, and then I'm going to show you. Tada! And I have...?
Child: Two.
Adult: How many do you think I have here?
Child: One more.
Adult: How did you know?
Child: Because.
Adult: Because what?
Child: You have three.
Adult: Oh, there was three, and so you know that there is two and how many more?
Child: One more.
Adult: One more! Perfect.
[Video ends]

Jenny Lerner: What is the future of Kids Play Math? Kids Play Math has received additional funding from the Office of Head Start to translate the program into an American Indian language, continue to pilot Head Start programs offering the online course. We will get feedback from teaching staff and coordinators about the online course. To translate the online Kids Play Math classroom with Spanish subtitles. We will be working with Puerto Rican programs to pilot the translation. We also received additional funding from the Toyota USA Foundation to extend the Kids Play Math games for kindergarten and first grade. Kids Play Math has received funding from the University of Denver and the

Office of Head Start to create a sustainable business model to serve the public good by further disseminating the project.

The online Kids Play Math class will help teachers and coordinators learn about the learning trajectories in early math. Coordinators will be able to support teachers in math in an ongoing basis. Coordinators and teachers will be able to work together supporting the integration of early math in the daily routine of the classrooms. Teachers and coordinators will receive a portfolio of their work for future reference.

Here are some details about the online class. The cost is $250 per participant with one free supervisor for each 12 participants. College credit is available from Adams State University for an additional fee. CEUs from the University of Denver with no extra fee. The course is designed to be taken in two or three months. Kids Play Math games may be used in a classroom where a teacher has taken and passed the course.