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Supporting all learners through high quality early childhood curricula: STREAMin³ implementation across Virginia

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Introduction: Curricula are an essential component of high-quality early learning experiences. Unfortunately, many early childhood educators face challenges in accessing evidence-based curricula, and implementation fidelity to curriculum is often poor without aligned support, including professional development for educators. This is especially true for educators within family day homes and private programs, who receive the lowest pay, struggle to access meaningful support, and leave the profession at high rates, compared to publicly funded programs.

Methods: In this paper, we describe the STREAMin³ birth-to-five curriculum model. We focus on describing how the curriculum model is intended to be used program-wide in infant, toddler, and preschool classroom, how the curriculum components support social, emotional, and academic skills, and how the aligned and embedded professional development model is designed to build educator capacity. We then present implementation data from the scaling of STREAMin³ during 2022 to 2023 in over 2,000 early childhood education classroom settings in Virginia that received state or federal funding.

Results: We found that educators used and enjoyed the curriculum. Educators at private programs and family day homes reported higher satisfaction, compared to those at public programs and in early childhood special education settings. On average, educators reported implementing curriculum components two to three days a week.

Discussion: We discuss implications, including the need to support educators across settings as curricula and other initiatives are implemented at-scale across states. We discuss the need for future research to explore approaches to increase educator engagement and implementation, with attention to the unique needs of different program types.

KEYWORDS

curriculum, early childhood education, implementation fidelity, research practice partnership, preschool, infant, toddler

Introduction

High-quality early childhood education (ECE) settings can foster young children's positive development, especially for children with social, emotional, or behavioral challenges (Ansari et al., 2021; von Suchodoletz et al., 2023). The elements of high-quality ECE include warm, caring, and supportive caregivers; culturally relevant classroom experiences; developmentally appropriate expectations and learning opportunities; outreach to families; and caregiver training and mentorship (Copple and Bredekamp, 2009; Iruka et al., 2020; Workman and Ullrich, 2017).

Unfortunately, many early childhood settings lack the resources and supports needed to provide high quality experiences for children, resulting in low scores on observational measures of classroom quality (McLean et al., 2021; Schaack et al., 2020). The lack of resources and supports is especially prevalent in center-based settings and infant and toddler classrooms (Bassok et al., 2016; Slicker et al., 2020). For decades, researchers, policymakers, and practitioners have sought ways to improve ECE quality to optimize children's learning and development, often through measurement and improvement strategies.

Curricula are an essential tool to provide young children with the best possible early learning experiences (Clements, 2007; Copple and Bredekamp, 2009; Workman and Ullrich, 2017). A high-quality curriculum formally describes the scope and sequence of a classroom's learning activities and defines the knowledge and skills that children are expected to have gained after a defined exposure period (Copple and Bredekamp, 2009). Curricula give structure to early learning programs by formalizing a program's philosophy, providing guidance on classroom set-up and materials, and helping educators identify activities to support children's learning. Educators¹ benefit from effective early childhood curricula that help them provide stimulating and engaging learning experiences for young children. To ensure equitable learning experiences, early childhood educators also need support to identify how curriculum practices and interactions in the classroom can be modified or enhanced to reflect the cultures, languages, and home experiences of the children served within their program (Friedman and Mwenelupembe, 2020; Iruka et al., 2020). With support, high-quality curricula also guide educators in differentiating instruction for children with disabilities or more intense social and emotional needs.

In this paper, we illustrate how a comprehensive birth-to-five curriculum model with aligned professional development, STREAMin³, was intentionally designed to build the capacity of early childhood professionals to foster high quality interactions and learning environments for all children. In the introduction, we describe the development and initial implementation of the curriculum and how STREAMin³ facilitates the inclusion of all young children, including those who need specialized social, emotional, and behavioral support across a variety of early childhood settings. We then present data showing initial uptake and satisfaction as evidence of the curriculum's feasibility for use at-scale. Our implementation scale-up data includes a large sample of early childhood educators across settings that serve many young children, but are less represented in the research, such as those serving within private child care centers and family day homes.

Curricula in early childhood settings

Curricula are an important element of high-quality ECE settings, as a tool to provide structure and guidance to educators to foster environments and interactions that promote young children's development. A recent preschool curriculum report defined essential features of curricula as having developmentally appropriate learning goals, a scope and sequence, coherent alignment with specific domains of development, and rich and engaging content (National Academies

of Sciences, Engineering, and Medicine, 2024). By laying out the scope and sequence of a classroom's learning activities and defining the knowledge and skills children are expected to gain, curricula guide educators to universally support children's development.

Coherence, continuity, and alignment are key components of best practice in curricula. An effective curriculum, when fully implemented with fidelity, should make it easier and more efficient for educators to engage in sensitive, responsive, and cognitively stimulating teacher-child interactions that foster specific school-readiness skills, including social and emotional skills. The use of curriculum can be an especially useful scaffold for providers in programs where turnover is high and where educators have less education and access to professional development, such as private programs (Bassok et al., 2016; Markowitz and Seyarto, 2023).

Research highlights the need to consider young children's development of key skills as interrelated and interconnected with development in one area often being dependent and influential for another area (e.g., Pons et al., 2019; ten Braak et al., 2019). Comprehensive curricula support development across all domains, including academic, social, and emotional domains. In a truly comprehensive curriculum, social and emotional domains of learning do not play a secondary role to academic domains. Rather, social and emotional development is integrated into all aspects of the curriculum. For example, consider an activity that promotes math *and* social skills through a series of activities focused on sharing fairly, a precursor to division. A child has been struggling to share classroom materials with peers. Knowing this, a teacher may feel more comfortable incorporating a discussion of sharing as a social skill (e.g., "How do you feel when a friend will not share the building blocks?") into the mathematics activity if the objectives of the activity actively encourage a dual focus on math and social skills. This approach may hold particular promise in supporting young children with social, emotional, and behavioral challenges because social and emotional skills are incorporated as learning targets that require attention, planning, and support on the same level as academic skills.

Gaps in our current understanding of how early childhood curricula are adopted and used

Despite the promise of comprehensive curricula, the majority of ECE curriculum research has been limited to curricula targeting a specific readiness skill designed only for preschool classrooms (e.g., a literacy program for 4-year-olds; e.g., Domitrovich et al., 2007; Goodrich et al., 2017; Justice et al., 2008; Lonigan et al., 2011; Sarama et al., 2012; Welsh et al., 2024; Wilson et al., 2013). This contrasts with most state-funded and federal programs which use (and in many cases encourage or mandate the use of) a comprehensive curriculum, focusing on multiple learning domains (Nguyen et al., 2018). Curricula that target only specific skills within a particular learning domain do not address the interdependent nature of young children's development across academic and social emotional domains. The few comprehensive curricula that have been evaluated are not inclusive of infant and toddler classrooms (e.g., Lonigan et al., 2015; Odum et al., 2019; Sarama et al., 2017).

Indeed, very little is known about curriculum implementation in early childhood settings, including how educators perceive and uptake

¹ In this paper, we use the terms "educator" and "teacher" interchangeably to refer to adults working in early childhood classrooms.

curricula. Most of the research that does exist focuses on lead preschool educators in public programs, largely ignoring educators in other roles such as teaching assistants, educators serving infants and toddlers, and educators working within private centers and family day homes. However, a significant number of young children are learning within these varied early learning contexts, including young children with social and emotional challenges, and so it is important to understand how new curricula are adopted and used within these environments. Further, previous early childhood curriculum implementation studies (i.e., Clayback et al., 2023) included smaller samples, and no published studies to our knowledge have considered implementation as a curriculum was scaled in the context of a statewide research-practice-policy partnership.

To address these gaps, this paper focuses on a newly developed curriculum model, STREAMin³, designed to be fully comprehensive and integrated, used in birth-to-five settings, and used across a wide variety of ECE sectors including private childcare and family day homes. In this paper, we provide initial evidence of the feasibility of implementation across early childhood settings that serve young children across a wide age range who have diverse social, emotional, and behavioral needs. Exploring curriculum implementation at-scale within a large heterogeneous sample of programs may provide information that can guide refinements in curriculum and professional development to more inclusively meet the needs of early childhood educators, young children, and their families.

Building the capacity of early childhood educators to implement curricula across settings

Many early childhood programs lack access to resources and professional development (PD) that support implementation of curricula. An evidence-based curriculum will only lead to intended learning outcomes for children when implemented with high implementation fidelity (Durlak and DuPre, 2008). Implementation fidelity is complex and multidimensional, and includes components such as dosage, adherence, and responsiveness (Dane and Schneider, 1998). When practices and curricula are implemented, implementation fidelity varies widely within and across classroom settings. Previous work has consistently demonstrated that positive outcomes increase when effective interventions are implemented with fidelity (e.g., Hamre et al., 2010; Pas and Bradshaw, 2012). Unfortunately, even when ECE programs do gain access to high-quality curricula, implementation tends to be poor when programs lack access to meaningful PD and support (Hemmeter et al., 2022; Whittaker et al., 2016). These low levels of implementation lead to diminished effects on classroom practices and child development (Domitrovich et al., 2010; Yang et al., 2019).

High fidelity implementation of a new curriculum requires sustained training and support (Cople and Bredekamp, 2009; Fixsen et al., 2013). Sustained training that is closely linked to practice helps educators transfer new programs into their daily practice (Darling-Hammond et al., 2017; Reinke et al., 2014). Practice-based coaching is a key PD strategy to build educator capacity to implement with high fidelity and ultimately improve positive outcomes from interventions. Practice-based coaching is a cycle through which coaches guide educators to set goals, plan, and work towards improving their teaching practice, incorporating

observation, reflection, and feedback (Snyder et al., 2015). The STREAMin³ curriculum model meaningfully integrates PD that is tailored to the unique needs of programs and classrooms to build capacity of educators to use the curriculum. In the scale-up effort that we focus on in the current study, the Virginia Department of Education provided significant funding and support to make professional development, including practice-based coaching, available to programs, with priority given to private centers and family day homes.

By focusing across program types, including private and family day homes, we can begin to unpack some sources of variability in engagement in professional development designed to build educator capacity to implement high-quality curricula. Privately funded settings serve many young children and families and are unique in a variety of ways that warrant research and policy attention. For example, educators in private programs on average have lower levels of education, lower pay, and work longer and more nontraditional hours than public preschool and K-12 teachers (Bassok et al., 2020; Greenberg et al., 2018; Reid et al., 2021). In Virginia, child care workers make approximately \$10.96 an hour, compared to preschool teachers who make \$15.91 an hour (McLean et al., 2021). Low levels of education and other challenges lead educators in private settings to face difficulty engaging in PD and implementing interventions with fidelity (Hemmeter et al., 2022; LoCasale-Crouch et al., 2023; Markowitz and Seyarto, 2023; Obee et al., 2023). To support educators across settings, we cannot take a one-sized-fits-all approach and assume educators across settings are experiencing PD and curricula in the same way. To address this, we present STREAMin³ implementation data, disaggregated by program type, to understand educators' experiences within and across different program settings.

Current study

In this study, we addressed the following research aims: (1) describe the STREAMin³ curriculum model and (2) describe how educators across settings engaged with the STREAMin³ curriculum and aligned professional development. To address aim one, we provide a full description of the curriculum model. To address aim two, we present implementation data from educators across different settings to understand how educators perceive and use STREAMin³ at-scale in the context of a research-practice-policy partnership across Virginia. This paper contributes to the literature by summarizing the development and state-wide implementation of a comprehensive birth-to-five curriculum designed in line with developmental science to build the capacity of educators working within a wide variety of programs and serving children who range in age from infancy through preschool.

Aim one: describing the STREAMin³ curriculum model

The STREAMin³ curriculum model supports children's development from birth through preschool across learning domains, is responsive to children's individual needs and diverse backgrounds, and embeds professional development (PD) as a core feature to facilitate strong implementation (Williford et al., 2018). STREAMin³ focuses on children's development of five Core Skills (Relate, Regulate,

TABLE 1 STREAM and Core Skills.

	What it is and how the curriculum supports it
STREAM Skills	
Science	Science for young children is about nurturing their natural sense of curiosity. Children use their senses to explore, make sense of their world, and deepen their inquiry skills. They observe, ask questions, and investigate to find answers. We support science skills through experiments and authentic experiences and by making the most of everyday moments created from their natural interest and excitement about their world.
Technology	Technology for young children does not mean computers and iPads. Technology means the use of tools to make things easier or to solve a problem, such as magnifying glasses, gardening tools, playdough, or cooking utensils. Children explore, test, and discover the right tool for the job.
Reading	Reading for young children does not mean formal reading. Children are building the foundations that are essential for later reading. Children explore letters, sounds, phonological awareness, print, and early writing. We nurture a love of books and stories and the knowledge that print has meaning.
Engineering	Engineering for young children means planning, designing, and building. Children are trying to understand and figure out why and how things work. Children actively explore how the world works through simple machines, forces, friction, and properties of water in the context of fun and creative problem solving.
The Arts	Art does not mean crafts; it means creativity. Children cultivate a love of the arts and a sense of self by focusing on the creative process rather than the product. Children engage in drama, music, and visual art using a range of materials and mediums.
Math	Young children are naturally excited and motivated to use math. Children are developing their skills in number sense, operations, comparing and measuring, patterns, and spatial sense. We support these skills by noticing and building on their mathematical observations through activities, games, and by using math talk all day.
Core Skills	
Relate	Relate is a child's skill to connect with adults, peers, and their sense of self. This includes building and maintaining relationships, managing conflict, and developing empathy and confidence. When children feel confident, valued, and connected to their educators and peers, it allows them to fully engage in the learning environment. Educators support the development of Relate skills by understanding how children develop, creating a warm and responsive classroom, and by using Intentional Teaching Practices in their interactions.
Regulate	Regulate is a child's skill to manage and cope with their emotions, attention, and behavior. When children use these skills, they are better able to attend to and actively engage in social and learning opportunities. Educators support the development of Regulate skills by helping children recognize and manage their emotions and by providing the structure and support that children need to manage their behaviors and attention.
Think	Think is a child's skill to think deeply about and make sense of the world around them. This includes observing, investigating, imitating, and thinking critically about what they encounter and experience. These skills are important building blocks for later development and school success. Educators support the development of Think skills by providing lots of opportunities for children to freely explore, by intentionally modeling and narrating, and by providing appropriate challenge and "just enough" support to help each individual child be successful at their own level.
Communicate	Communicate is a child's skill to communicate with others productively. This includes the development of vocabulary and the skills needed to both understand and express language. For older children, these skills include building concepts of early literacy that include print knowledge, writing, and sound awareness. Educators support the development of Communicate skills by creating an engaging and social learning environment that intentionally encourages and incorporates opportunities to frequently use language. There is additional guidance on supporting dual language learners.
Move	Move is a child's skill to move their body to achieve their goals. This includes the development of gross and fine motor skills, as well as the ability to care for and make healthy choices for themselves. Educators support the development of Move skills by providing a positive and safe environment for children to observe and try new movements, foods, and self-care routines, and by promoting children's independence.

Think, Communicate, and Move) and six STREAM Skills (Science, Technology, Reading, Engineering, Art, and Math). See [Table 1](#) for a description of the Core and STREAM Skills.

Central to the theory of change, STREAMin³ is a single curriculum used at the program-level, spanning infant, toddler, and preschool classrooms. We conceptualize that a single curriculum across ages will enhance children's learning through continuity in their learning experiences across ages paired with activities that are purposefully tailored for each stage of development. The program-level approach provides coherence, continuity, and alignment for children and educators and creates a common lens and language for communication among children, families, educators, and leaders. This helps to ensure continuity in caregiving beyond the classroom, while providing opportunities for programs and families to collaborate and work together in promoting children's development. Further, early childhood educators often move between classrooms or age groupings

due to coverage and turnover; program-wide alignment in curriculum eases these transitions, including by supporting a sense of safety and stability for young children. Professional development experiences can also be more impactful when educators are using a shared language and common resources that enhance open, regular, and positive communication and collaboration.

STREAMin³ supports educators to be highly intentional about the social, emotional, and academic learning experiences children experience each day. To do so, STREAMin³ provides a comprehensive set of curriculum components, including classroom routines, daily schedules, and activities. The learning objectives are integrated across domains, intentionally calling educators' attention to multiple domains of development that can be addressed within each activity. Using this framework, instruction focuses on the whole child by encouraging development of multiple skills at once, true to the ways that children develop outside of the classroom. [Table 2](#) describes the

TABLE 2 STREAMin³ curriculum components.

Component	Age range	Description
Curriculum Information	Preschool, toddler and infant	Guidance for understanding the curriculum components and how to use them, the theoretical framework, how to use STREAMin ³ to support every learner—considering diversity, inclusion, and equity, how to make modifications, descriptions of supports and practices for literacy and language and math, crosswalks to other standards or tools, and tools for gathering or purchasing materials.
Core Skills and Subskills	Preschool, toddler and infant	Information about each of the Core Skill Subskills, including how it develops, what it looks like, and the best activities, routines, and Intentional Teaching Practices to support it. Each week, educators are prompted to focus on learning and exploring a new Subskill as an embedded professional development tool.
STREAM Skills	Preschool and toddler	Information about the six STREAM Skills, including what they are and activities that support them.
Core Skill Routines	Preschool, toddler and infant	Routines to support children's development of Relate, Regulate, and Communicate skills (e.g., a Name Writing Routine used during arrival and visuals for supporting social problem solving).
STREAM Group Activities	Preschool and toddler	Group activities that support children's understanding of specific content areas (i.e., math, science, engineering, art, language and literacy, technology) while intentionally weaving in support for the Core Skills. This includes daily provocations during arrival to promote exploration prior to the activity. <i>4 per week.</i>
STREAM Story Activities	Preschool and toddler	Language and literacy-focused activities based on high-quality children's books. Includes guidance for extending to other parts of the day or other skills. <i>4 per week.</i>
Small Group Stories	Preschool and toddler	Fifty activities for small groups to explicitly and systematically support literacy skills (i.e., phonological awareness, print knowledge, and early writing) using the children's books from the STREAM Story Activities.
STREAM Games	Preschool and toddler	Over 40 instruction cards and printable materials for games focused on supporting a variety of Core and STREAM Skills (e.g., literacy, math, and engineering).
Quick Activity Cards	Preschool and toddler	Over 100 brief activities to support Core Skills across the day with guidance for the best times to use them.
Play Activity Cards	Infant	Over 50 interactions and activities to use with infants to support the Core Skills through different types of play (e.g., tummy time, songs, and fingerplays).
Parts of the Day and Room	Preschool and toddler	Tools and guidance for supporting the Core and STREAM skills across each part of the day (e.g., circle time, meals, rest, transitions) or room (e.g., centers, outdoors).
Family Engagement	Preschool and toddler	Quarterly and weekly letters for sharing information about a child's development that invite family input and over 80 Family Activity Cards for families to use to support the Core Skills at home.
Observation Tools and Assessments	Preschool and toddler	Formative and progress-monitoring child assessments and classroom-level observations to assess implementation fidelity and the quality and equity of interactions. STREAMin ³ assessment tools are used to inform practice and provide targeted support.

main curriculum components. Figures 1, 2 provide examples of a toddler activity and a preschool activity card, designed to be flexibly used throughout the day. For more examples, visit the STREAMin³ website at <https://streamin3.org/streamin%2c2%b3-curriculum-model-2/how-it-works/curriculum-overview/> or our Virginia Early Childhood Education Resource Hub at <https://eceresourcehub.org/ece-resource-hub/core-skills/>.

Additionally, the STREAMin³ curriculum model includes aligned PD that is flexible and embedded within the curriculum program. Teachers attend group trainings, and some receive individual practice-based coaching depending on needs. Program leaders are encouraged to attend teacher trainings *and* trainings designed for leaders, which encourage them to take true ownership of program-wide implementation while forming connections with other local leaders. The development of the PD resources was guided by implementation science, finding that simply providing curriculum resources is not enough to support implementation; educators need ongoing and relevant training to implement any curriculum with

high fidelity. The PD is intentionally designed to support educators' understanding of child development and increase the effectiveness of their implementation of the curriculum by tightly aligning PD with classroom practice and tailoring support to meet individual educator and classroom needs. The PD model deliberately structures collaborative engagement across classrooms involving educators, leaders, and classroom aides. This facilitates continuity in support for implementation and experiences of children.

STREAMin³ development

STREAMin³ was designed and developed by a team of researchers, content developers, and instructional designers to combine best practices for early childhood teaching and interactions with aligned and sustainable PD support for programs. Our team at the Center for Advanced Study of Teaching and Learning (CASTL) at the University of Virginia developed the STREAMin³ curriculum at the request of,

and in collaboration with, a Virginia early childhood advocacy group (Elevate Early Education [E3]) to serve as a model of what high quality early learning could look like in Virginia. The curriculum was initially developed from 2015 to 2018 with funding from E3 using an iterative design process in collaboration with a racially diverse group of teachers and leaders serving children from diverse cultural and socioeconomic backgrounds at their model demonstration school.

Since then, the team has continued revising and developing materials based on ECE expert reviews; a review for diversity, equity, and inclusion; and continuous feedback from providers using the curriculum in the field. From 2018 to 2021, STREAMin³ was piloted in 112 state, federal, private, and faith-based early childhood classrooms across several regions of Virginia. The results of this pilot were used to revise and further develop

MIXING COLORS WITH FRIENDS

T-W1A4

Children will make new colors with their friends by giving each other high-fives with paint.



STREAM FOCUS



CORE SKILL OBJECTIVES

INTENTIONAL TEACHING PRACTICES

Children will:

Teachers will:

THINK



Active Exploration Reasoning

- ◆ Actively Explore Colors
- ◆ Observe and Explore How Things Change

- ◆ Use Comments and Questions to Encourage Exploration
- ◆ Prompt Children's Explanations

RELATE



Peer Relationships

- ◆ Share Space and/or Materials with Peers
- ◆ Collaborate and Work Together with Peers

- ◆ Acknowledge Positive Peer Interactions
- ◆ Provide Support During Teamwork

GET READY

MATERIALS

- ◆ Paint (at least two different colors)
- ◆ Paper plates
- ◆ Large paper
- ◆ Smocks

PREPARATION

- ◆ For each pair of children, choose two different colors of paint and pour each color on a plate.
- ◆ Write both children's names on a piece of paper.
- ◆ Place the paper in front of children.
- ◆ See Additional Resources for more tips.



TEACHING TIPS

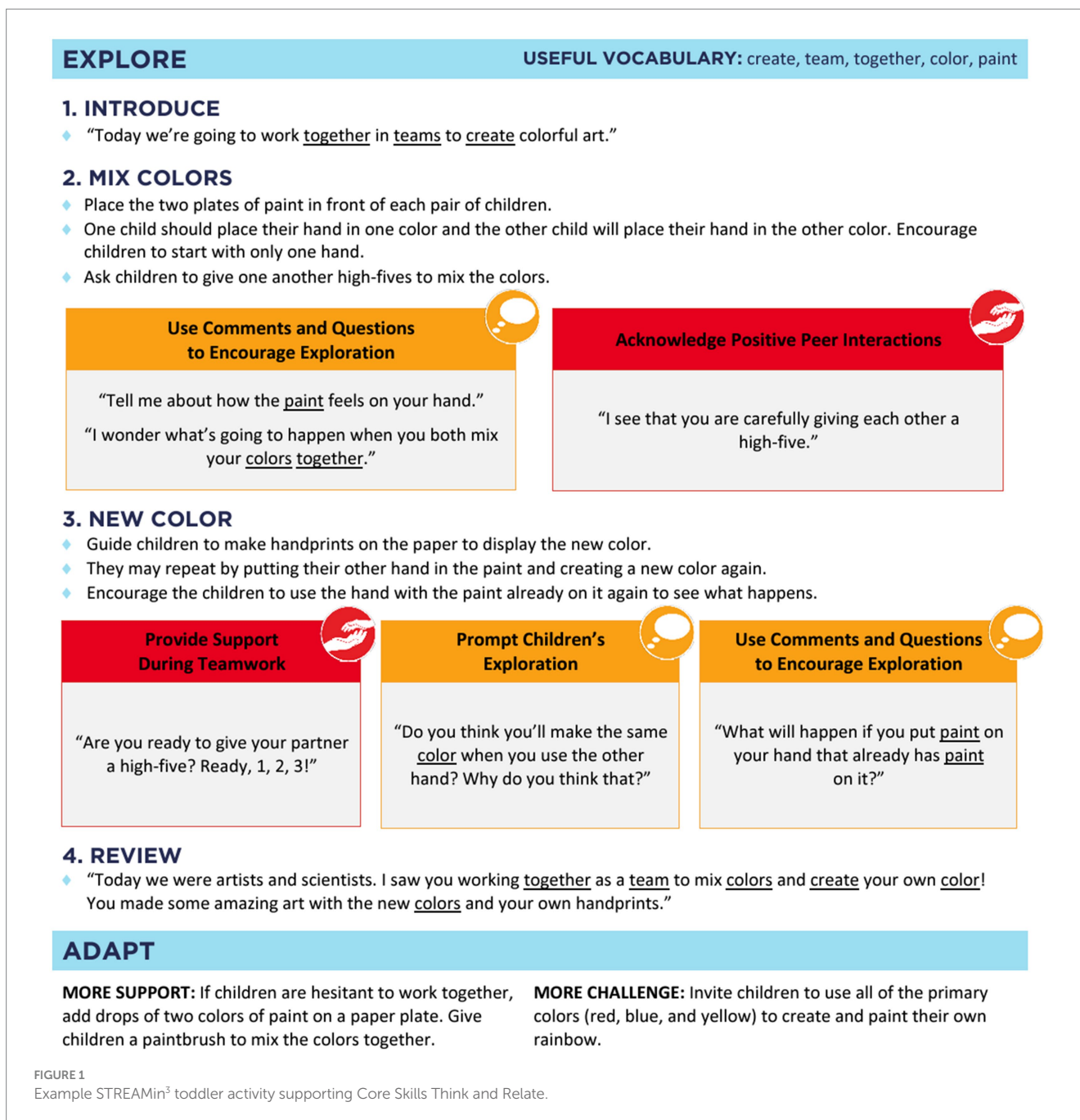
BIG PICTURE

This is a fun and messy activity that will promote collaboration, laughter, and connection between peers by encouraging them to have fun and work together to create something new.

SET THE STAGE

Children may be encouraged to stand and do this activity or sit facing each other. Give each pair of children plenty of space to do the activity. If possible, have an additional teacher or volunteer present, or complete in small groups or pairs.

FIGURE 1 (Continued)



STREAMin³ (Williford et al., 2021). Pilot results indicated that leaders and educators enjoyed the curriculum and were engaged in implementation. Despite significant disruptions from the COVID-19 pandemic, educators increased their implementation dosage and adherence over time (Clayback et al., 2023). Coaching was identified as a critical component of implementation with teachers finding coaching valuable, and coaching being linked with increases in implementation fidelity. Educators also self-reported gains in their ability to support children’s Core Skill development, to be intentional in integrating Core Skills into activities and parts of the school day, and to follow children’s interests and individualize based on children’s needs (Clayback et al., 2020).

Aim two: building capacity for STREAMin³ implementation through professional development

Our second aim, describing how the STREAMin³ model builds capacity of early childhood educators, uses data from the 2022–2023 scale-up year to understand how educators across different settings perceive and use STREAMin³ at-scale. First, we describe the scale-up process. We then describe the professional development offerings to demonstrate how we built educator capacity to implement the curriculum. Finally, we provide survey data across the year to understand how educators across settings perceived and used the curriculum.

Aim two methods

STREAMin³ scale-up context

Following the success of the development and pilot of STREAMin³, the curriculum was independently vetted and added to the Virginia Department of Education’s (VDOE) Approved Curriculum list in 2019. In 2021, through a competitive process, STREAMin³ was selected by VDOE as the state supported, low- to no-cost, comprehensive, birth-to-five curriculum option. Beginning

in 2022, programs accepting public funding, participating in practice year two of the state’s quality improvement initiative (VQB5), and not yet using a curriculum were deemed a priority by VDOE and were provided, at little to no cost to the provider, the option of adopting the STREAMin³ Curriculum Model for their programs. VDOE’s intention was to make a high-quality comprehensive curriculum option available for private centers and family day homes, who often lack the monetary resources necessary to purchase and maintain training for curriculum materials and implementation.

Through our research-practice-policy partnership, VDOE and our teams sought to (1) Ensure all publicly funded, birth-to-five educators in Virginia have access to a high-quality, comprehensive curriculum, (2) Provide professional development to help programs adopt and fully use the curriculum, and (3) Develop sustainable resources so programs can continue to fully use the curriculum beyond the initial rollout years. As part of this partnership, our team has provided the curriculum materials and PD resources needed to eligible publicly funded early childhood programs who chose to adopt STREAMin³ as their curriculum. From 2022 to 2023, our team onboarded over 2,000 infant, toddler, and preschool classrooms within more than 400 programs who chose to adopt STREAMin³ across Virginia (see Table 3 for program and classroom information). Programs include state-funded preschool programs, Head Start programs, Early Childhood Special Education Programs, private center-based programs (for profit and not for profit, including faith-based), and family day homes, with priority given to private programs and family day homes receiving public funding. Teacher demographic data was collected through a statewide data system, LinkB5, as part of Virginia’s unified measurement and improvement system, VQB5 (see Table 4).

STREAMin³ model of tailored professional development during 2022 to 2023

Throughout the year, educators were supported to implement STREAMin³ with a host of optional professional development opportunities, including universal professional development, such as asynchronous online courses, as well as individualized PD, like coaching. Professional development was tailored to the needs of programs and individual educators. We offered all educators within participating classrooms onboarding during August 2022, which included a six-hour training focused on preparing educators to start implementing the curriculum. Topics included the purpose behind STREAMin³, an overview of the model, supporting the Core Skills with intention throughout the day, and modifying the curriculum to meet the needs of every child and program. Participants had

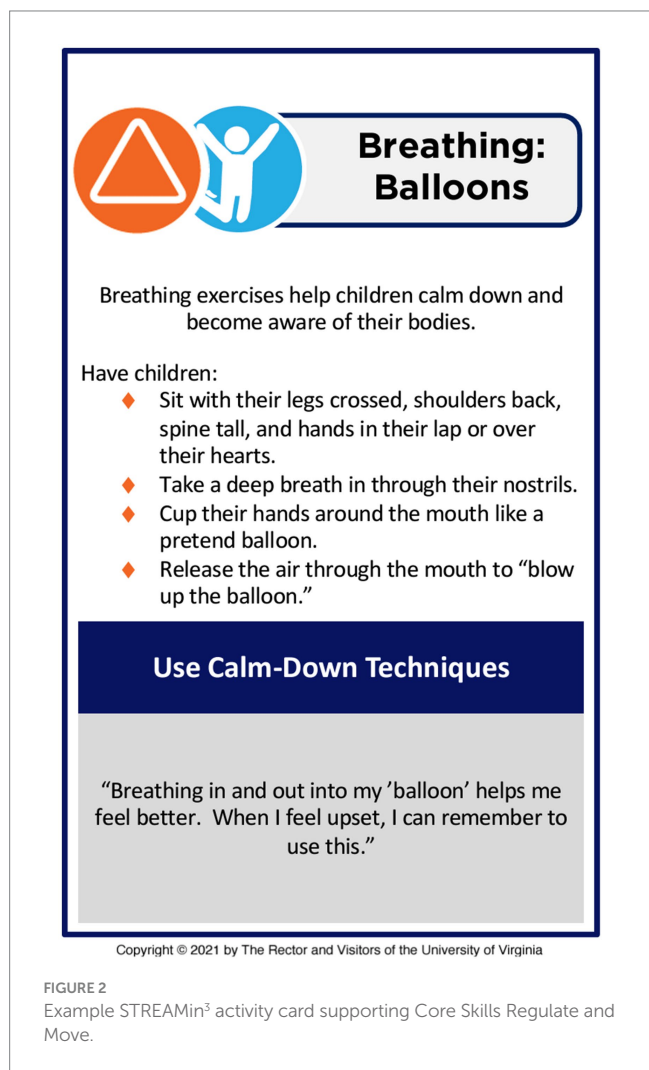


TABLE 3 Enrolled programs and classrooms by age and type from 2022 to 2023.

Program type	Programs	Infant/toddler classrooms	Preschool classrooms	Total classrooms
Family day homes	163	166	161	327
Private	229	703	574	1,277
ECSE	24	32	89	121
Head start	9	34	28	62
Virginia Preschool Initiative (VPI)	36	12	110	122
Multiple	17	42	65	107
Total	478	989	1,027	2,016

TABLE 4 Demographics of enrolled educators from 2022 to 2023.

	Mean (SD)	Percent
Teacher demographics		
Years of ECE experience	9.66 (9.30)	–
Women	–	96.66%
Education		
High school diploma/GED or less	–	38.81%
Child Development Associate (CDA)	–	5.94%
Some college	–	20.24%
Associates degree	–	9.63%
Bachelor's degree	–	16.44%
Master's degree or higher	–	8.94%
Race		
White	–	48.56%
Black	–	34.43%
Hispanic	–	9.92%
Other Race**	–	6.06%

*Other teacher races included: Asian (4.30%), Native American, American Indian, or Alaska Native (0.59%), and Native Hawaiian or Other Pacific Islander (1.17%).

opportunities to interact with facilitators and other educators, collaborate in small groups, and explore the resources to feel confident as they started to implement STREAMin³. Participants were encouraged to view the onboarding resources in a digital portal if they were unable to attend a session.

Educators within all participating classrooms were also encouraged to engage in an on-demand “Deeper Dive” course. The Deeper Dive into STREAMin³ on-demand course launched in January 2023 through a learning management system. All participants were encouraged to complete the course, which consisted of one overview and eight learning modules. Each 20-min learning module included classroom videos, opportunities for practice and application, and chances to check for understanding and to test knowledge. Upon completion, users are awarded five professional development hours. The course was advertised through mass emails, individual outreach by coaches to programs, and newsletters. A total of 685 users enrolled for the Deeper Dive course, with 523 of those users having at least one view, indicating that they successfully accessed and started the course. Based on the completion of quizzes at the end of each module, 226 users completed the entire course.

Finally, educators within selected programs were offered individualized direct coaching, including wraparound support for navigating the on-demand course and other implementation questions. Practice-based coaching was tailored to the needs of individual programs and teachers. Offerings included cycles of 30-min weekly coaching sessions, action planning, and observations and video review. Depending on teacher interest and need, coaching cycles focused broadly on (1) supporting Core Skills across parts of the day, (2) making the most of activities and games, and (3) using Core Skill Routines. Priority for coaching was provided to family day homes and private programs that reported not using a curriculum at all or using a home-grown curriculum. Invitations to adopt coaching were sent through mass emails with surveys, follow-up emails, cold calls, promotional videos, and postcards. To understand how teachers

experience coaching, our team defined “coaching engagements” as coaching meetings, in-person regional group PD, and site-specific, in-person group PD. Though they occurred regularly, it does not include activities such as emails, quick check-ins or logistical calls, texting, voicemails, or leaving messages.

Data collection

Universal professional development participants

During 2022–2023, our UVA team conducted data collection using a winter and spring survey for educators who were offered opportunities to engage in universal PD but not direct coaching. To encourage survey completion, participants were sent multiple reminders and were compensated with gift cards for completing each survey. The winter survey focused on understanding how educators were implementing the curriculum. We invited 1,502 lead teachers to report on how often they were using various curriculum components in their classroom, and 612 responded (41% response rate). Lead teachers reported on how many days in the past week they used each curriculum component, including the Core Skill Focus of the Week, Arrival/Provocation, Group Activities, and STREAM Stories. For each component, teachers also rated how beneficial they found it on a scale from 0 (not at all beneficial) to 10 (very beneficial).

On the spring survey, we invited 2,582 providers to report on their end of year satisfaction with the curriculum and professional development and 1,193 responded (46% response rate). We asked a series of questions to understand how providers felt about STREAMin³. In this paper, we report on responses to the following items (1) “How much do you enjoy learning about and using the STREAMin³ curriculum?” and (2) “How likely are you to recommend the STREAMin³ curriculum to a colleague?” on a scale of 0 to 10, with anchors at of not at all (0), neutral (5), and very much (10).

Direct coaching participants

In total, 417 educators representing 305 classrooms from 130 programs registered for direct coaching. Teachers participating in direct coaching were invited to complete a survey facilitated by partners at Virginia Commonwealth University, and 163 teachers completed the survey from November 2022 to January 2023. Teachers were asked about their perception of the curriculum using six items (e.g., “I like STREAMin³”; “STREAMin³ seems suitable for my classroom/program”) on a scale of completely disagree (1) to completely agree (5), and the items had high reliability ($\alpha = 0.92$). In the results, we present averages of these items, broken up by program types, to understand how teachers receiving direct coaching perceived the curriculum.

Aim two results

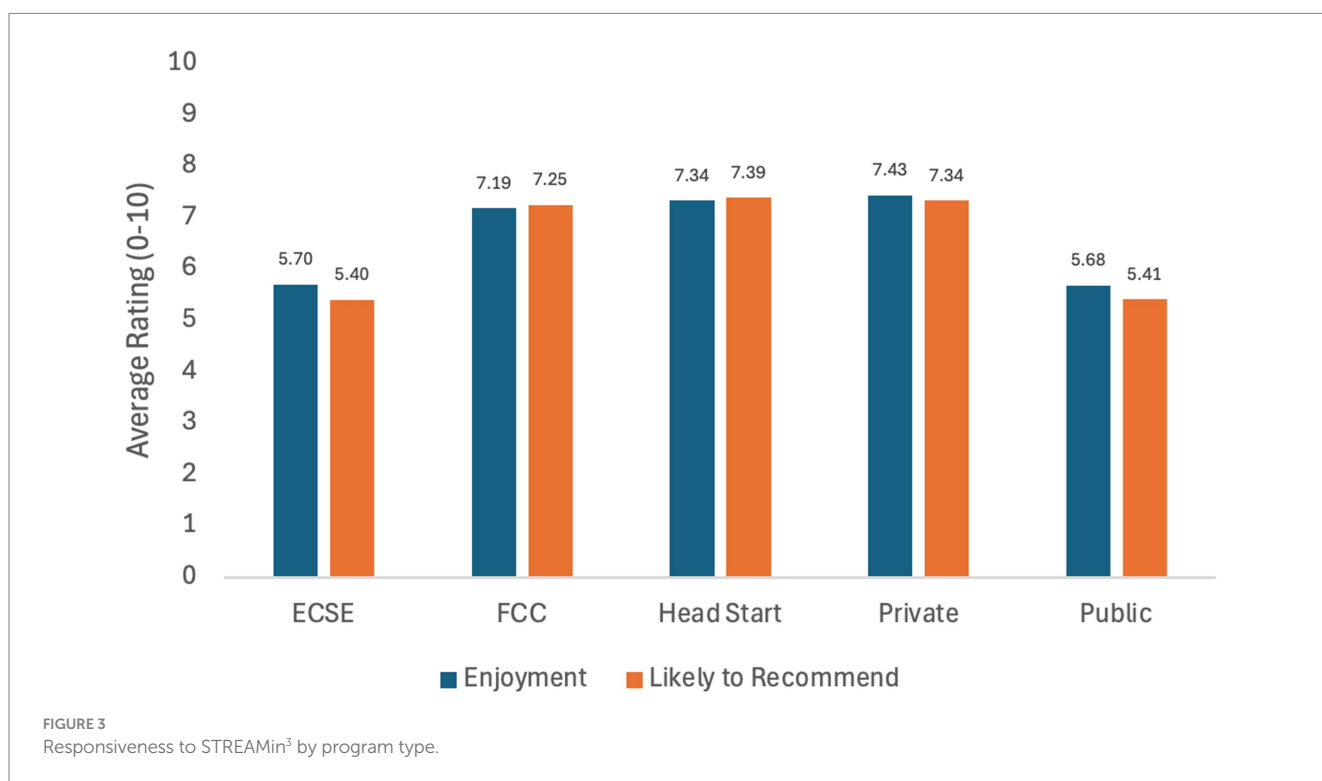
Implementation among universal PD participants

Our main research question sought to understand implementation and specifically how early childhood educators across different settings perceived and used STREAMin³ at-scale. Results are reported below for items from the surveys, disaggregated by program type. These analyses help us understand how educators in different work settings that have different levels of resources and support perceive

TABLE 5 Days of curriculum component implementation by setting.

Component	Private	FDH	Head Start	ECSE	Public
Core Skill Focus					
Days	2.95 (1.91)	2.44 (1.59)	1.40 (2.19)	1.81 (2.11)	2.77 (1.92)
Benefit	7.45 (2.13)	6.00 (2.00)	8.00 (1.41)	5.06 (2.54)	5.44 (2.55)
Arrival/Provocation					
Days	2.73 (2.01)	2.33 (1.32)	2.00 (2.00)	1.39 (1.92)	1.49 (1.95)
Benefit	7.46 (2.35)	6.11 (1.62)	7.00 (2.45)	5.81 (2.51)	5.77 (2.69)
Group Activities					
Days	3.20 (1.79)	1.67 (1.12)	2.40 (2.30)	1.88 (2.17)	3.19 (1.62)
Benefit	7.97 (2.09)	6.63 (2.00)	7.67 (1.15)	5.31 (2.73)	6.06 (2.64)
STREAM Stories					
Days	3.24 (1.75)	2.78 (2.28)	2.40 (2.51)	1.94 (2.02)	3.04 (1.80)
Benefit	8.06 (2.17)	7.86 (2.54)	8.00 (2.00)	6.18 (2.63)	6.04 (2.70)

Days ranged from zero to five, and Benefit ranged from zero to ten. FDH, Family day homes. ECSE, Early Childhood Special Education.



and use the curriculum. Understanding different perceptions helps us tailor professional development support to educators across settings depending on their unique needs.

First, we examined teacher reports of their use of and how beneficial they found various STREAMin³ curriculum components. On average, infant, toddler, and preschool teachers across settings reported using the curriculum components *Core Skill Focus of the Week* 2.83 days a week (SD = 1.94), *Arrival/Provocations* 2.51 days a week (SD = 2.04), *Group Activities* 3.07 days a week (SD = 1.83), and *STREAM Stories* 3.11 days a week (SD = 1.82). Averages by program type are reported in Table 5. Overall, curriculum component use and benefit ratings were highest among educators

in private programs. When educators reported finding a component more beneficial, they tended to also report using it on more days of the week.

Next, we considered educators' overall perception of STREAMin³, using responsiveness items on the spring survey. The two items were highly correlated ($r = 0.88, p < 0.001$); educators who reported enjoying the curriculum more were more likely to recommend it to a colleague. Overall, responsiveness was high in the spring; enjoyment of the curriculum was 7.06 out of 10 on average (SD = 2.36), and likelihood of recommending was 6.94 on average (SD = 2.62). Responsiveness was highest among educators in private programs, Head Start programs, and family day home settings (see Figure 3).

Responsiveness was lowest among educators in Early Childhood Special Education settings and publicly funded programs.

Implementation among direct coaching participants

Overall, participation in coaching was low. Of the 417 registered teachers, 31% had zero “coaching engagements.” For the 287 that had at least one coaching engagement, the average number of engagements was 4.6, with a median of 3. Of the 105 family day home providers, 13% had zero “coaching engagements.” For the 91 that had at least one coaching engagement, the average number of engagements was 7.04, with a median of 7. For the 312 private program teachers, 37% had zero coaching engagements. For the 196 that had at least one engagement, the average was 3.47, with a median of 2. Coaching was offered for approximately 7 months, so ideally, teachers would have had seven to 14 engagements. Barriers shared with coaches included limited time and staffing for meetings, turnover, and fatigue with multiple initiatives.

To understand how teachers receiving direct coaching perceived the curriculum, we examined averages of the six survey items on responsiveness, broken up by program types. Overall, responsiveness among direct coaching participants was high, with an average of 3.86 ($SD = 0.79$) out of five. Responsiveness was highest among family day home providers ($n = 46$; $M = 3.94$, $SD = 0.77$), compared to those at private centers ($n = 95$; $M = 3.84$, $SD = 0.84$) and Head Start ($n = 22$; $M = 3.78$, $SD = 3.41$).

Discussion

Curricula are an essential component of high-quality early learning experiences. Unfortunately, many early childhood educators face challenges in accessing evidence-based curricula, and implementing curriculum with fidelity requires aligned supports. These supports are often unavailable to educators, especially those in lower-resources settings such as small private centers and family day homes, where educators tend to receive the lowest pay, do not access to PD supports, and are more likely to leave the program and the field of ECE. In this paper, we described the STREAMin³ comprehensive birth-to-five curriculum and presented data from the implementation scale-up across early childhood education settings in Virginia. We found that most educators used and enjoyed the curriculum. Educators at private programs and family day homes reported higher satisfaction, compared to those at public programs and in early childhood special education settings. We review these main findings below.

STREAMin³ is a comprehensive curriculum designed to integrate a focus on social, emotional, and academic development across infant, toddler, and preschool ages. This integrated approach promotes the inclusion of children with varying social and emotional needs, as it supports teachers to give the necessary attention and support to skills such as problem-solving skills, friendship skills, and emotion regulation, rather than seeing these skills as barriers to or secondary to academic learning. Further, the curriculum model includes professional development to meet educators where they are and build capacity to implement the curriculum with high fidelity. In the current study, PD offerings included asynchronous online courses and other universal support,

as well as individualized coaching for programs deemed a priority (i.e., private and family day homes).

In this paper, we presented data from educators across settings, including private programs and family day homes, to understand how educators perceived and used the curriculum. We found that most teachers enjoyed the curriculum and were likely to recommend it to a colleague, though differences emerged based on program type. In particular, private, family child care, and Head Start providers had higher satisfaction, compared to state-funded public and early childhood special education settings. We also found that, on average, educators reported implementing curriculum components two to three days a week. When educators reported finding a component more beneficial, they tended to also report using it on more days of the week. Curriculum component use and benefit ratings were highest among educators in private programs. Differences in satisfaction and implementation by program type are important to understand, as STREAMin³ and other early childhood curricula and initiatives are ideally intended to be used in classrooms across the many early childhood sectors. Thus, these findings point to the need to understand why educators across different program types have varied experiences. In our partnership with VDOE, we were asked to provide the most outreach to programs who had not previously used an approved curriculum, which were small private centers and family day homes. This increased outreach may have resulted in educators feeling more comfortable with the curriculum, leading to higher satisfaction ratings. Our findings point to the importance of tailoring implementation support depending on the unique needs of programs.

For teachers who were offered direct coaching, participation was lower than expected, with nearly a third of enrolled direct coaching teachers having zero coaching engagements. For direct coaching educators who did have coaching engagements, they engaged in an average of almost five coaching sessions. The average was higher when disaggregated by program type – specifically, family day home providers engaged in an average of 7 coaching activities, whereas private providers engaged in an average of 3.5 coaching activities. Coaches reported that barriers to participation included staff turnover, limited time, and fatigue with multiple initiatives. Previous research has also consistently found that turnover, a lack of time and resources, and teacher burnout impede participation in PD and implementation. Future research should explore these barriers and potential solutions to increase educator engagement, with attention to the unique needs of different program types.

This paper has several limitations that future research can address. First, we present descriptive data that relies on educators’ self-report. Though this provides insight into how educators experienced the curriculum, it is unclear how strongly self-reports of implementation relate to observed implementation. Future research should incorporate observational measures of curriculum implementation in classrooms to better understand day-to-day use of the curriculum. There is also a need for experimental research on curricula to understand how a curriculum like STREAMin³ may impact teaching practices and children’s social, emotional, and academic outcomes. Finally, though our study includes a large sample of providers across a variety of settings, our data and findings are limited to Virginia, and it is unclear how these findings may generalize to other state contexts. Our study contributes to the early childhood education literature by

examining implementation in a large sample of early childhood educators and has implications for facilitating implementation fidelity across settings to better support educators and young children's development.

Data availability statement

The datasets presented in this article are not readily available because we do not have permission to share externally. Requests to access the datasets should be directed to Kelsey Clayback, kac5fd@virginia.edu.

Ethics statement

The studies involving humans were approved by University of Virginia Institutional Review Board for the Social and Behavioral Sciences. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KC: Conceptualization, Data curation, Formal analysis, Investigation, Visualization, Writing – original draft, Writing – review & editing. AW: Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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