

North Carolina Pre-K Pyramid Model Evaluation Study

Implementation and Outcomes Evaluation Study Final Results

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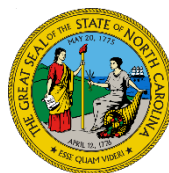
Sandra L. Soliday Hong, PhD

Robert C. Carr, PhD

Ronald Seifer, PhD

Aditi Nambiar, BA

Jada Walker, MA



NC DEPARTMENT OF
**HEALTH AND
HUMAN SERVICES**
Division of Child Development
and Early Education

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This report is available at <https://fpg.unc.edu/projects/evaluation-pilot-pyramid-model-nc-pre-k-classrooms-private-center-based-programs>.

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Executive Summary

The Frank Porter Graham Child Development Institute at UNC Chapel Hill (FPG) partnered with the North Carolina Department of Health and Human Services Division of Child Development and Early Education (NCDHHS DCDEE) to assess a pilot implementation of the NC Preschool Pyramid Model (Pyramid Model). This social-emotional coaching program is designed to enhance the use of evidence-based practices to support social-emotional development for NC Pre-K classrooms located in private center-based preschool programs in one urban and three rural counties. The two-year evaluation involved eighteen focus groups and interviews with coaches, administrators, teachers, and parents/guardians, alongside measures of teacher-child interactions and child outcomes across 40 participating public and private Pyramid and Business-as-Usual classrooms with a total of 253 children.

Classroom outcomes. Pyramid Model classrooms had moderate to high-quality teacher-child interactions that improved over the year. Pyramid Model teachers demonstrated improved use of evidence-based practices and more of them were observed engaging children in intentional social-emotional activities compared to high-implementing Business-as-Usual classrooms. Concerning classroom practices remained stable and low in Pyramid Model classrooms but increased in Business-as-Usual classrooms. Public school Pyramid classrooms outperformed private center-based classrooms in observed quality and fidelity of implementation.

Child outcomes. Children in Pyramid Model classrooms had higher social skills ratings than the national average, demonstrated more initiative, and had fewer children screening positive for need of additional support services than Business-as-Usual classrooms. Behavioral concerns increased more in Business-as-Usual classrooms, while both groups showed improvements in behavioral regulation. Public school Pyramid attendees also had more positive relationships with adults.

In summary, piloting the Pyramid Model in private center-based settings resulted in improved use of effective teaching practices, reduced referral identification of children, and improved children's confidence and independence. Study findings reflect that classrooms were prepared for implementation and were more favorable than previous studies, and similar effects may be observed upon scaling but with classrooms that are likely less ready than those reflected in this study. Finally, scaling is contingent on

adequate statewide staffing, planning time, and related resources, particularly for classrooms located in private center-based settings.

Introduction

The Frank Porter Graham Child Development Institute at UNC Chapel Hill (FPG) partnered with the North Carolina Department of Health and Human Services Division of Child Development and Early Education (NCDHHS DCDEE) to conduct an evaluation of a pilot implementation of a social-emotional coaching program to support NC Pre-K teachers to engage in beneficial evidence-based practices, known as the NC Preschool Pyramid Model (Pyramid Model), in selected private center-based preschool programs where NC Pre-K classrooms are housed. The pilot implementation of the Pyramid Model was an expansion of the existing implementation of the Pyramid Model in NC Pre-K classrooms located in public school settings to include classrooms located in privately operated preschools. The evaluation study was comprised of two components: a process/implementation study and an outcomes evaluation study. The process evaluation study focused on what supports may be necessary to implement the Pyramid Model to fidelity in programs with supports associated with NC Pre-K classrooms, which will be helpful in creating optimal conditions for a supported early care and education (ECE) workforce. The outcomes evaluation examined the extent to which independently collected measures of teacher-child interactions and child social skills, behavior problems, and emotion knowledge are associated with implementation of the Pyramid Model or not across public and privately located NC Pre-K classrooms. A separate, but related goal was to assist with the identification of metrics that can be used by NC Pre-K programs to monitor fidelity of implementation and child outcomes in the future.

Pyramid Model

The *Pyramid Model for Promoting Young Children's Social-Emotional Competence* (Pyramid Model; Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003; Hemmeter, Ostrosky, & Fox, 2006) was developed in a university setting with implementation supports provided by two regional education laboratories (RELs), and with further implementation supports and coaching providing in North Carolina by the FPG Early Learning Network. The Pyramid Model is comprised of a set of evidence-based practices (EBPs) designed to support children's social-emotional competence and to reduce in-class problem behaviors. Further, implementation follows a multi-tiered system of support framework (MTSS) with three stages: whole class, small group, and individual foci. A summary of goals for children and teachers identified in the literature are listed below (Hemmeter et al., 2006; 2021):

Goals for children: reduce challenging behavior in classrooms; promote social-emotional competence, capacity to develop positive social relationships, ability to concentrate and persist on challenging tasks, and ability to effectively communicate emotions; to problem solve; and to prevent suspensions and expulsion.

Goals for teachers: reduce inappropriate behavioral practices; build positive relationships with children, families, and colleagues; design supportive and engaging environments; teach social and emotional skills; and develop individualized interventions for children with the most challenging behavior.

Theory of Change

The theory of change for the North Carolina Implementation of the Preschool Pyramid Model includes a summary of the Pyramid Model components, dosage, contextual moderators, proximal, distal, and long-term outcomes (see Appendix Figure 1). This theory of change was revised and updated in collaboration with key stakeholders and served to guide the selection of study methodologies and measures and the final design of the evaluation study of the pilot implementation of the Pyramid Model in center-based NC Pre-K classrooms. The content of the teacher training materials, existing coaching support logs from prior implementation, and observation of past classroom implementation were used to identify any gaps between the expansive social-emotional goals of the intervention and the on-the-ground implementation. For example, if the focus is primarily on tools to support children with appropriately organizing their behavior to facilitate tasks and minimize disruptions in the classroom then we would not expect children to also gain emotional knowledge. Additionally, if the classroom schedule prioritizes activities that support academic learning, then we would not expect children to have sufficient opportunities to engage socially to the extent that complex social relationships or reciprocal extended pretend play would take place. Educational models like Pyramid involve many components. The extent to which the model is implemented fully (or to a limited extent) depends on the priorities of the system and classroom in which implementation takes place. The purpose of this evaluation study was to identify the facilitators and barriers to full implementation of the Pyramid Model in NC Pre-K classrooms, and to examine the degree to which intended outcomes for teachers and children were attained.

Research Questions

1. Are **classrooms** where the Pyramid Model is implemented demonstrating improved practices intended to support children’s social-emotional development?
 - a. Do Pyramid and Business-as-Usual classrooms have similar or different observed classroom practices?
 - b. Do the patterns of classroom observations differ for Pyramid implementation in public versus private classrooms?
 - c. If Pyramid public and private classroom observation scores are different, are there any differences in classroom or teacher characteristics that might inform future improvement efforts?

2. Do **children** enrolled in classrooms where the Pyramid Model is implemented demonstrate improved levels of social-skills and behavioral regulation and reduced behavioral concerns?

3. What factors were identified by Pyramid stakeholders as **facilitators and barriers** to implementing the Pyramid Model to fidelity?

Summary of Methods

An adapted study approach based on the RE-AIM framework for assessing impact and sustainability was utilized (Glasgow, Vogt, Boles, 1999). This framework includes the following components: Reach, Effectiveness, Adoption, Implementation, and Maintenance. The adapted study approach focuses on implementation outcomes, service outcomes, and client outcomes (Enola Proctor et al.; 2009, 2011). This evaluation study focused on examining the quality of the classrooms and implementation of the Pyramid Model (“Service Outcomes”), and finally the degree to which children and their families were impacted by participation in NC Pre-K and a classroom implementing the Pyramid Model or not (“Client Outcomes”). Then we focused on knowledge, attitudes, and beliefs of key stakeholders at the beginning of implementation and the following year (“Implementation Outcomes”). These stakeholders included teachers, parents, county-level administrators, and state level staff responsible for various components of Pyramid implementation.

Outcomes Evaluation Study

Classroom Observations

Classroom observations were conducted mid-year and end-of-year in a sample of classrooms that participated in the Pyramid Model pilot and similar NC Pre-K classrooms with interest in participating but had not yet participated (Business-as-Usual classrooms). Classroom teachers were eligible to participate in the Pyramid Model pilot if they were located in a participating county, had not yet received Pyramid Model coaching, and were located in a private center-based setting. Comparison NC Pre-K classrooms were selected within the same counties who were engaging in classroom practices as usual (Business-as-Usual classrooms) both within NC Pre-K classrooms located in public school and private center-based settings. A second comparison group of NC Pre-K classrooms within the same counties were selected if they were also receiving Pyramid Model coaching but were located in public school settings. This design allowed for us to examine the degree to which classroom practices and related social skills for children were: (1) similar or different for NC Pre-K classrooms implementing the Pyramid Model with the primary difference being the location of the classroom, and (2) similar or different for NC Pre-K classrooms operating as usual in private center-based settings or public school settings.

The Teaching Pyramid Observation Tool (TPOT™) for Preschool Classrooms was used to assess teaching practices through observations as well as teachers' responses to interview questions. Assessments were conducted over the course of one school day at mid-year and end-of-year. The TPOT yields 14 different scores that reflect the degree to which teachers are observed implementing evidence-based practices in 14 Key Practice areas, an overall score that reflects the percentage of the 14 Key Practice items that were implemented to fidelity (% scored yes/no met or not met), and a "red flag" count. The red flag count reflects the number of times that aspects of classroom structural (e.g., space not set up to facilitate independent child engagement with materials) or process quality (e.g., negative climate or chaotic transitions) that do not facilitate the use of evidence-based practices were observed. These red flag incidents may also involve observed occurrences of challenging behavior for children. Scores can vary from 0 to 17.

Classroom teachers were also observed to examine the degree to which teacher-child interactions were positive, language rich, and the classrooms were well-organized using the Classroom Assessment Scoring System (CLASS), 2nd Edition: Pre-K–3rd. Three subscales of the CLASS were used in this study, as well as an activity setting code that indicates whether social-emotional focused activities were observed. The three CLASS domains include: Emotional Support, Classroom Organization and Instructional Support

and is scored on a scale from 1-7 (a higher score reflecting higher-quality practices). Each CLASS domain score is calculated as an average of dimension and domain scores given during five 30-minute blocks of observation. The activity setting code indicates on a scale of 1-3 the relative time spent in a particular content area (1=no time spent, 2=some time less than 50% or not consistently, and 3=children spent most of their time engaged in activities related to a particular content area). Activity setting scores were averaged across the 5 observation cycles. We utilized the social-emotional activity setting content area for the purposes of this study. Observers looked for evidence of teachers and children using activities and materials which support their ability to name, understand, and regulate their emotions and relate with each other positively and constructively. For the purposes of this study, we calculated the proportion of observation cycles where any social-emotional development activities were observed (score of 2 or 3).

Child Assessments, Teacher, and Family Surveys

Child outcomes were measured using two teacher report measures and direct assessment. Teachers were sent survey links to complete the Devereux Early Childhood Assessment (DECA; Gresham & Elliott, 2008) about individual children's social skills, problem behaviors, and academic competence. The DECA also includes clinical thresholds to identify children who are displaying particularly strong social skills and behavior problems that reach levels of concern that are likely in the clinical range. Teacher-reported behavior on the Teaching Strategies GOLD assessment (TS Gold; Lambert, Kim, Taylor, & McGee, 2010) is routinely collected in NC Pre-K classrooms and we used summaries of administrative child records in the study classrooms to examine teacher-reported information about children's social-emotional development among all available children in the administrative records. Finally, a direct assessment of children's behavioral regulation skills was administered by trained data collectors as part of the research study team, the Head Toes Knees Shoulders-Revised (McClelland et al., 2014).

Surveys were also distributed via online methods (and by paper if requested) to teachers and families. Teachers were surveyed to ask about their demographic information and professional background. Families were asked about their child's previous preschool experience and demographic information, and about the child's primary caregiver's (parent/guardian) education and income levels.

Two-hundred fifty-two children were assessed as part of the study. The children were 4.50 years on average at the beginning of the school year and 47.83% female. Three

counties participated in the child assessment portion of the study: Burke (n = 21), Caldwell (n = 51), and Wake (n = 181); 28.46% of the children attended an NC Pre-K classroom in a rural county. Their teachers reported that 14.64% of students had an intellectual and/or developmental disability which may or may not qualify the child for an individualized education plan (IEP). There were 4.67 months between assessments for children on average. Seventeen percent of the children were identified as Spanish-English dual language learners.

The family information form was completed by 57% of parents and guardians (n = 144). These parents/guardians responded that their child's race was: American Indian/Alaska Native (0.72%), Asian (3.62%), Black/African American (47.83%), Other (13.77%), and White (43.48%). Parents could select more than one racial category. Of those, 26.95% reported having a Hispanic/Latino ethnicity. Twenty-one percent of children spoke a language other than English as their first language (17.02% Spanish). Their highest level of education was: 52.98% high school degree or less, 20.90% AA/AS, and 26.23% BA/BS or higher. Thirteen percent of parents responded that their child has an Individualized Education Plan (IEP). Only 25.71% of children attended a preschool or pre-K program as a 3 or 4 year old in the year prior to the study, and fewer than half of those children attended for 31 hours or more per week (41.67%).

Data Collection Procedures

Assessments were conducted in the mid-year and the end-of-year by a professional data collection team who were trained to reliability standards prior to initiating data collection and maintained those standards throughout data collection that exceed published minimum standards for each study measure. All data collectors met the inter-rater reliability criteria recommended by the TPOT measure developers prior to gathering data in the field (i.e., exact agreement on > 80% of the key practice indicators and red flags) with trainers, and with all the coaches we worked with in co-observing and scoring of the TPOT. All data collectors also met the inter-rater reliability criteria recommended by the CLASS measure developers (i.e., within-one-point agreement on > 80% of dimension scores).

Focus Groups

NC Pre-K administrators, teachers, Pyramid coaches, county leads, and parents/guardians of children enrolled in participating Pyramid Model and comparison classrooms were invited to participate in focus groups and interviews. The participants were contacted twice by email and were offered multiple dates and time options to accommodate as many participants as possible, including morning, noon, and afternoon

options on weekday/non-holiday dates, as well as evenings and weekends. Focus groups for coaches, administrators, teachers, and parents/guardians were held separately. Eighteen focus groups and interviews were conducted across the two years. Participants were asked about resources they received to support children's social-emotional learning and what they wished teachers and families had access to. They were also asked about their experience in accessing available resources and how they supported children and families. Participants were subsequently asked for their observations on the components of the implementation Pyramid Model that were effective or ineffective to help provide children support for their social-emotional development.

Participants

Classroom Observations and Child Assessments

We conducted classroom observations and child assessments in selected Pre-K classrooms. The Treatment group was defined as the NC Pre-K classrooms participating in the pilot Pyramid Model implementation (i.e., in their first year of Pyramid Model implementation). The Business-as-Usual comparison groups included two groups of programs within the same county: (1) similar private NC Pre-K programs who have not yet implemented the Pyramid Model, and (2) public school programs also implementing the Pyramid Model. A total of 40 classrooms participated in the study with the breakdown of classroom participant status listed in Table 1 below. Of those classrooms, 38 received both a mid-year and end-of-year observation and two classrooms were missing 1 classroom observation timepoint (1 missed in mid-year and 1 missed in the end-of-year).

Table 1. Number of Participating Classrooms by Pyramid Model Participation Status and Location.

Table 1	Pyramid Model (N=31)	No Pyramid Model (N=9)
Public School (N=16)	13	3
Private, Center-Based (N=24)	18	6

A total of 253 children enrolled in 40 classrooms participated in the study. Of those, 251 were assessed either in the mid-year, the end-of-year, or both, with 2 children who were

not assessed due to illness on the scheduled and rescheduled assessment dates. Up to 7 children whose parent/guardian had given permission for the child to participate in the study were randomly selected per classroom, resulting in an average of 6.33 children per classroom enrolled in the study across the 40 study classrooms. The largest group of children represented in the study were enrolled in Pyramid Model pilot classrooms located in private center-based settings (see Table 2).

Table 2. Number of Participating Children by Pyramid Model Participation Status and Location.

Table 2	Pyramid Model (N=196)	No Pyramid Model (N=57)
Public School (N=102)	82	20
Private, Center-Based (N=151)	114	37

Parents or guardians of children who were given permission to participate in the study were invited to complete a survey about their family with a 57% response rate. The children who participated

and had a family survey completed were about half female (48%), mostly identified as Black/African American (36%), White (33%), or Hispanic (25%) with 6% identifying as another race or ethnicity. A majority of children (67%) were identified as multi-racial/ethnic because the family selected more than one race/ethnicity. The Pyramid group tended to have more children who identified as White than in the Business-as-Usual group, however, once the location of the program was also considered the four groups had similar distributions in terms of race/ethnicity. Additionally, 17% of the children were Spanish-English dual language learners, 15% were reported by their teacher to have an intellectual or developmental disability, 2% wore glasses, and 26% were enrolled in a preschool program the year prior to pre-K (42% of those children were enrolled 30 hours or more per week). Children’s primary parent/guardian’s highest level of education was most often a high school degree or GED (43%), 10% had less than high school, 21% had an AA/AS degree, and 26% had a BA/BS or higher level of education. Approximately half of families (49%) reported having incomes of \$40,600 or less.

Focus Groups

We had a wide range of representation of Pyramid coaches, administrators, teachers, and parents/guardians who participated in the focus groups. Teachers and administrators represented inclusive classrooms (that serve a higher proportion of

children with disabilities than typical NC Pre-K classrooms), public school and private program settings, and rural and urban areas of North Carolina. Respondents from programs and classrooms not implementing the Pyramid Model were largely not represented in the focus groups; only one teacher in the Business-as-Usual classrooms agreed to participate despite outreach in all four categories of respondents in these classrooms/programs. All four counties participating in the study were represented in the focus groups: Burke (3), Caldwell (14), Iredell (1), and Wake (19). In total, 38 people participated in focus groups and interviews. Five people participated both years: 4 coaches/county leads and 1 teacher. In 2022, 12 people participated in focus groups or interviews. In 2023, 31 people participated in focus groups or interviews.

Results

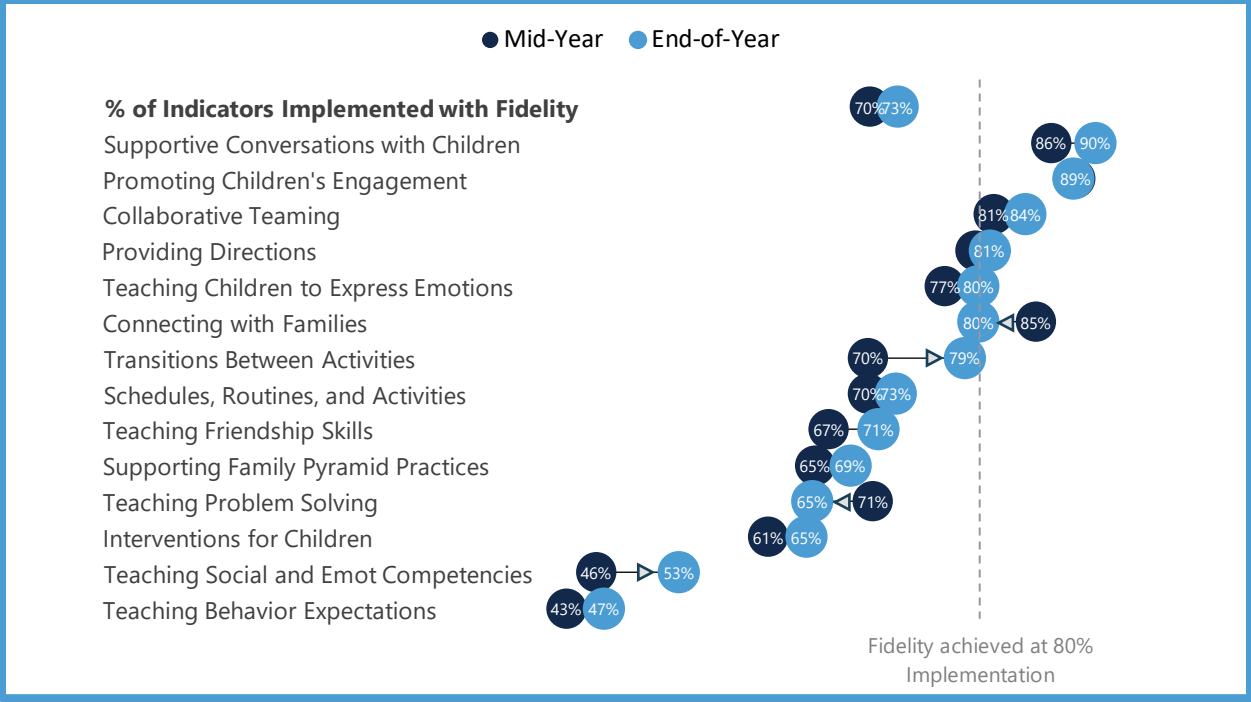
Results From Outcomes Study

Research Question 1: Are classrooms where the Pyramid Model is implemented demonstrating improved practices intended to support children’s social-emotional development?

Pyramid Model Classrooms – Quality and Fidelity

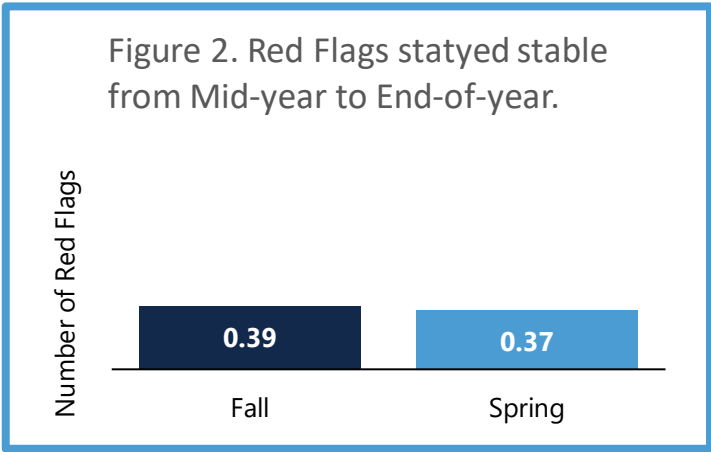
NC Pre-K teachers in Pyramid classrooms demonstrated stability or improvements in their teaching practices as measured by the percentage of TPOT indicators implemented to fidelity (70% mid-year to 73% end-of-year). They also improved in 12 out of 14 of TPOT indicators between the mid-year and end-of-year (see Figure 1; a higher proportion of scores, or movement to the right from mid-year to end-of-year in the figure reflect improvement). Two scores declined slightly (i.e., *Connecting with Families* and *Teaching Problem Solving*). No changes were statistically significant.

Figure 1. Pyramid classrooms demonstrated many improvements in their classroom quality from mid-year to end-of-year.



The number of *Red Flag* instances observed for Pyramid classrooms remained low and relatively stable (see Figure 2).

Figure 2. Red Flags stayed stable from Mid-year to End-of-year.



NC Pre-K teachers in Pyramid classrooms demonstrated stability or improvements in their teaching practices.

NC Pre-K teachers in Pyramid classrooms demonstrated a high degree of stability in their teacher-child interactions between the mid-year and end-of-year as measured by the overall score, and the Emotional Support and Classroom Organization domains of the CLASS Pre-K. Instructional Support scores declined slightly (see Figure 3). No changes were statistically significant.

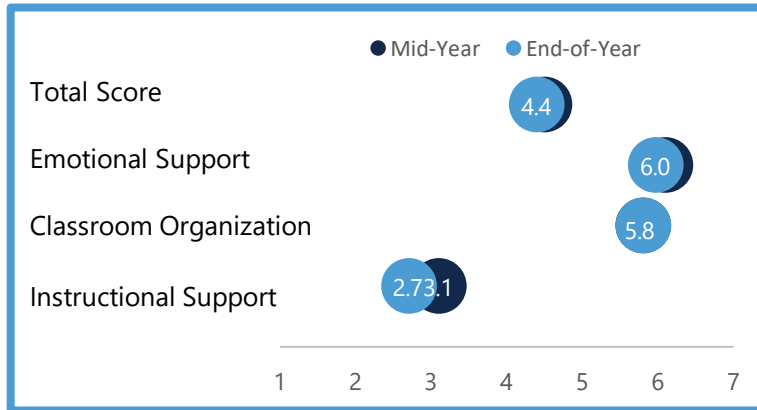


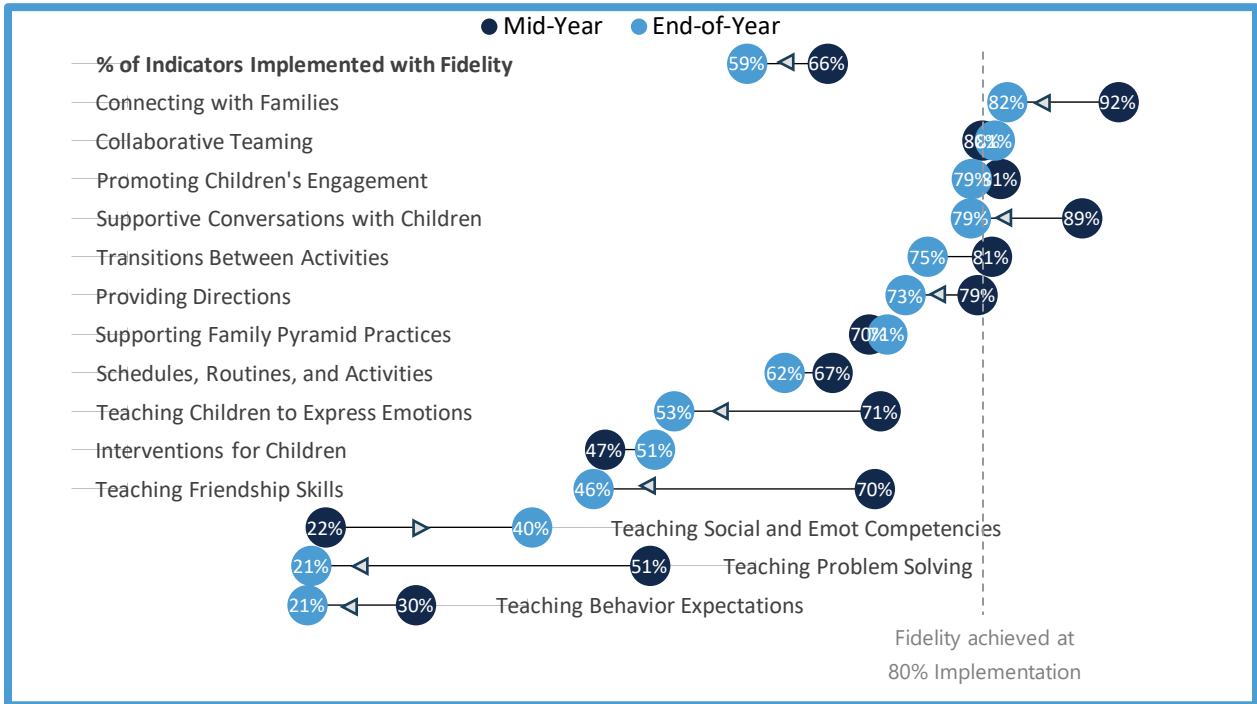
Figure 3. Pyramid classrooms demonstrated a high degree of stability and slight decline in their teacher-child interactions from **mid-year** to **end-of-year**.

Research Question 1a: Do Pyramid and Business-as-Usual classrooms have similar or different observed classroom practices?

Pyramid versus Business-as-Usual Classrooms: TPOT Scores

The percentage of TPOT items implemented with fidelity in the Business-as-Usual classrooms was 4% lower than Pyramid classrooms at mid-year and continued to decline by 7% at the end of the year whereas Pyramid Model classrooms increased by 3% from mid-year to end-of-year. A difference of 14% in TPOT items implemented with fidelity was observed by the end of the year. Moreover, while Pyramid classrooms demonstrated improvements in 11 out of 14 teaching practices from mid-year to end-of-year, Business-as-Usual teachers demonstrated declines in 10 out of 14 teaching practices (see Figure 4).

Figure 4. Business-as-Usual classrooms did not participate in coaching related to evidence-based practices. Nonetheless, several of these practices were demonstrated and there was also a pattern of using these practices. As expected teachers demonstrated the use of the practices less frequently from mid-year to end-of-year.



Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 5. Pyramid classrooms stayed stable in the proportion of TPOT indicators implemented with fidelity from the mid-year to end-of-year, while Business-as-Usual classrooms declined.

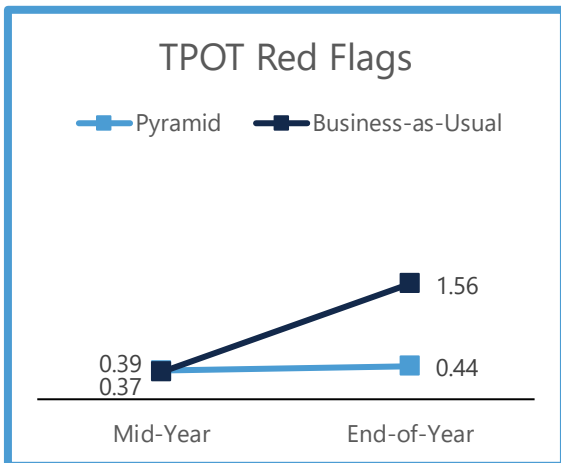
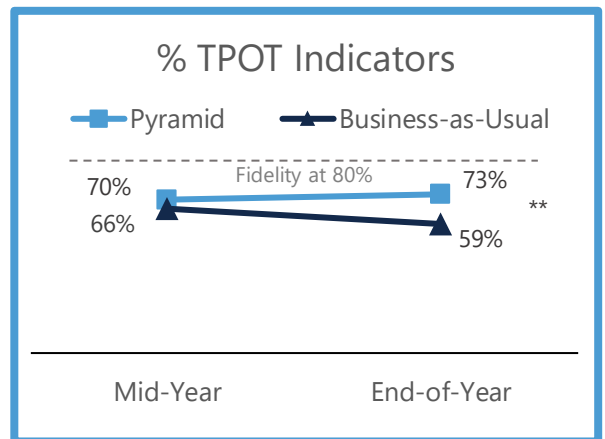


Figure 6. Pyramid classrooms stayed stable in the number of observed TPOT red flags from the mid-year to end-of-year, while Business-as-Usual classrooms started out with similar levels at mid-year and increased from mid-year to end-of-year.

Pyramid versus Business-as-Usual Classrooms: CLASS Pre-K Scores

Both Pyramid and Business-as-Usual classrooms demonstrated a high degree of stability and some decline in observed levels of teacher-child interactions from mid-year to end-of-year.

Figure 7. Pyramid classrooms had slightly higher CLASS Emotional Support scores at mid-year, but they converged by the end of the year.

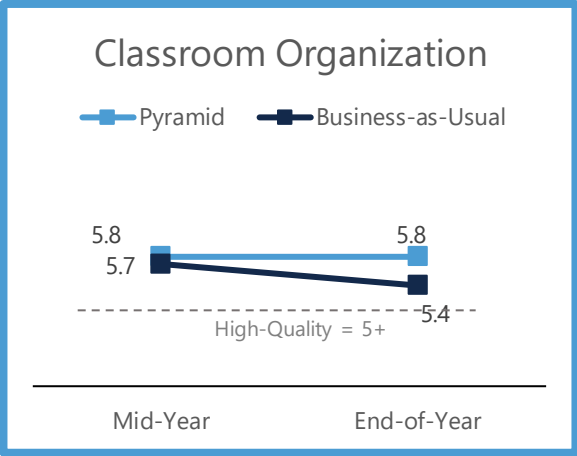
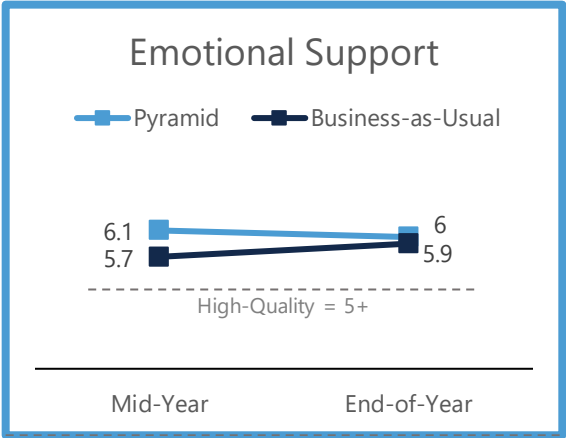
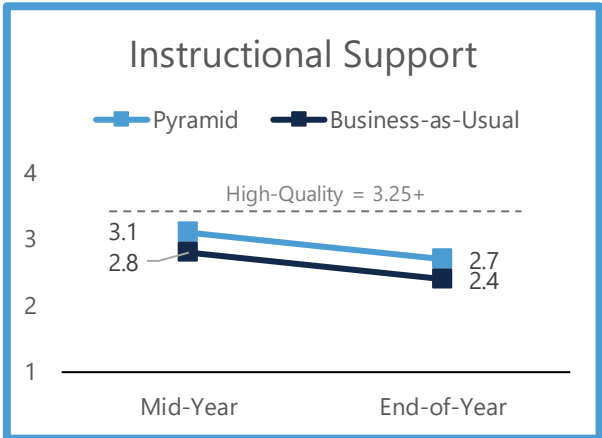


Figure 8. Pyramid classrooms had similar CLASS Classroom Organization scores than Business-as-Usual classrooms at mid-year but had slightly higher scores by the end of the year.

Figure 9. Pyramid classrooms had slightly higher CLASS Instructional Support scores than Business-as-Usual Classrooms at mid-year and despite slight declines in scores overall, differences in scores persisted through the end of the year.



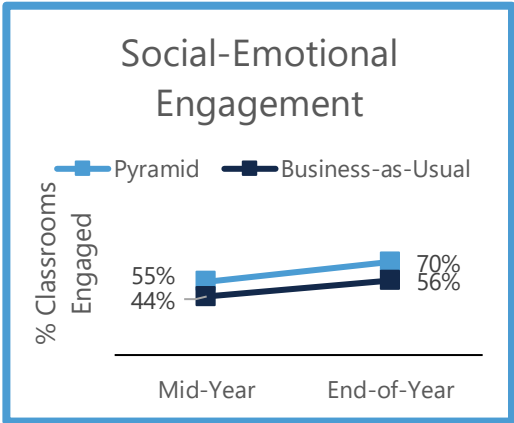
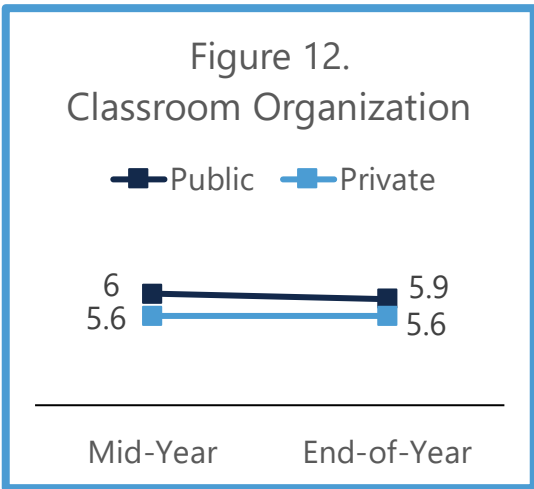
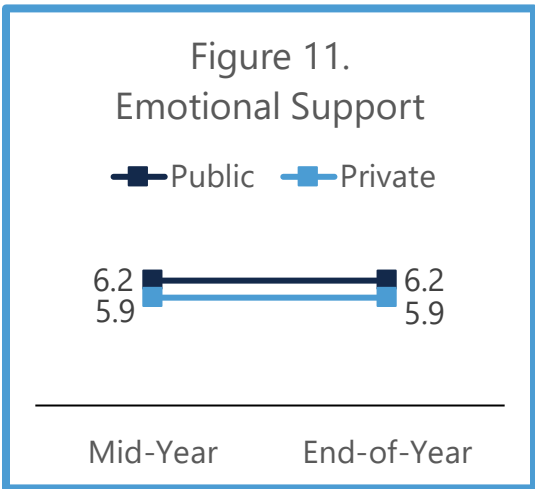


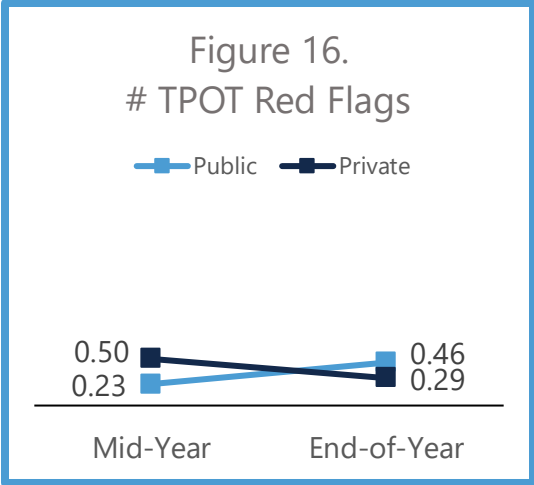
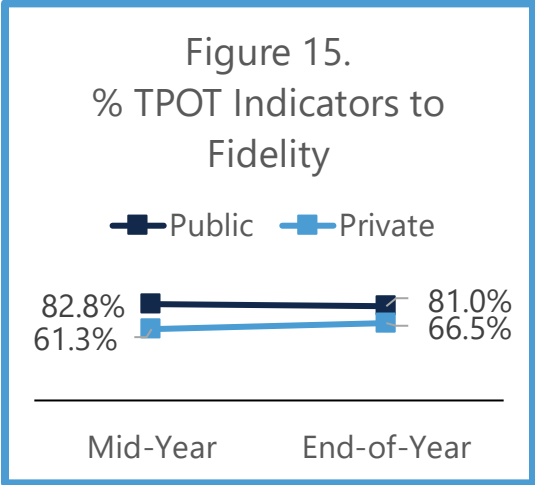
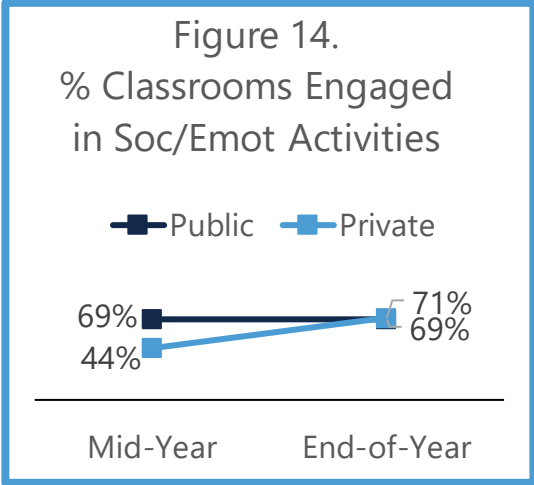
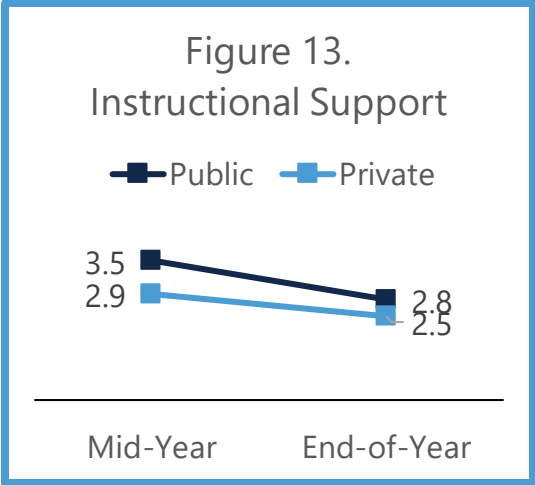
Figure 10. Most NC Pre-K classrooms were observed having children engaged in social-emotional learning activities at least some of the time during their observation. A higher proportion of Pyramid classrooms had social-emotional activities observed at both time points than Business-as-Usual classrooms, but both classroom types increased from mid-year to end-of-year with regard to the proportion of classrooms where social-emotional learning activities were observed.

Pyramid Public versus Private Classrooms: Quality and Fidelity

Research Question 1b: Do the patterns of classroom observations differ for Pyramid implementation in public versus private classrooms?

Classroom quality was high across CLASS domains regardless of the location of the NC Pre-K classroom participating in this study. However, classrooms located in public school settings had slightly higher scores overall than classrooms located in private center-based settings. See Figures 11-16.





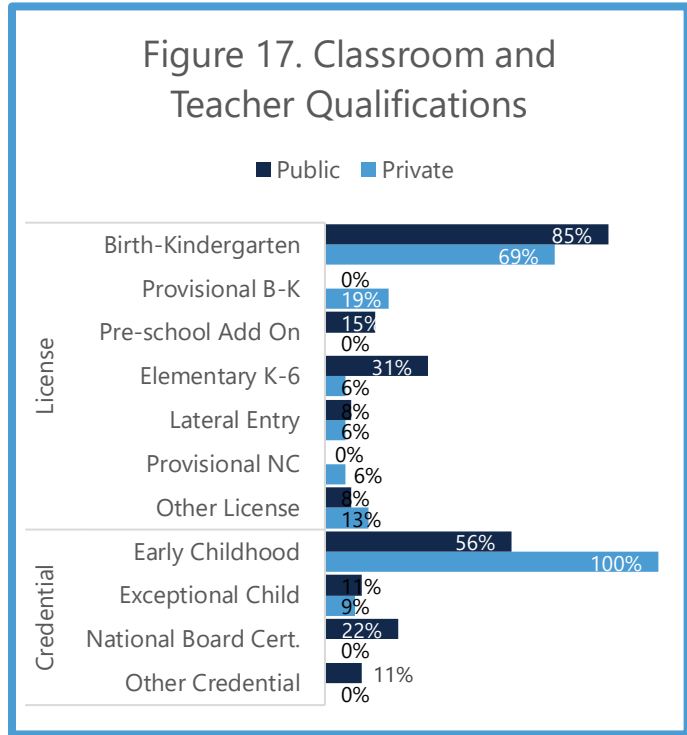
Research Question 1c: If Pyramid Public and Private classroom observation scores are different, are there any differences in classroom or teacher characteristics that might inform future improvement efforts?

Pyramid Public versus Private Classrooms: Characteristics

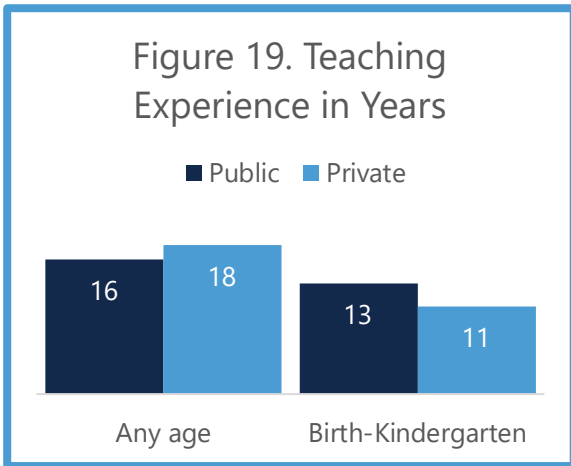
Figure 17. Public and privately located NC Pre-K teacher licenses and credentials.

Pyramid classrooms in our sample were more often located in public schools ($d = 0.21$) and teachers in our sample more often held a teaching license in elementary education ($d = 0.51$), but not a Birth-Kindergarten credential ($d = -0.63$). See Figure 17.

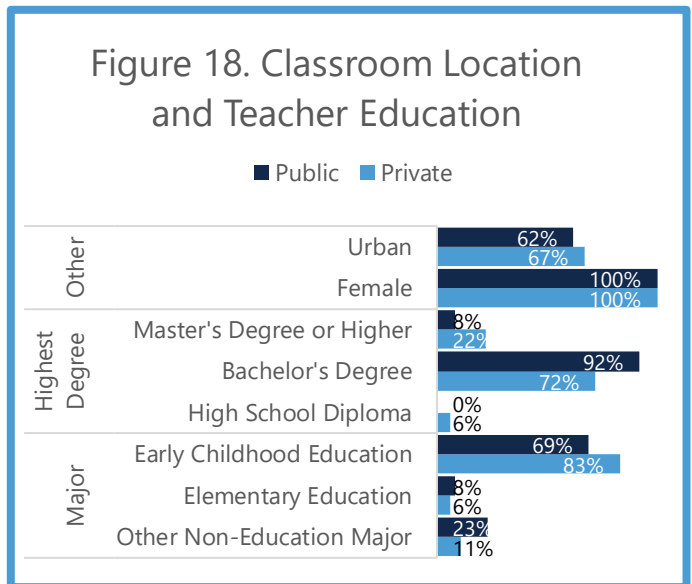
Teachers in classrooms located in private center-based settings often had early childhood degrees and held a master's degree versus teachers in



classrooms located in public schools who had a non-education major more frequently and more often had bachelor's degrees as their highest level of education. See Figure 18.



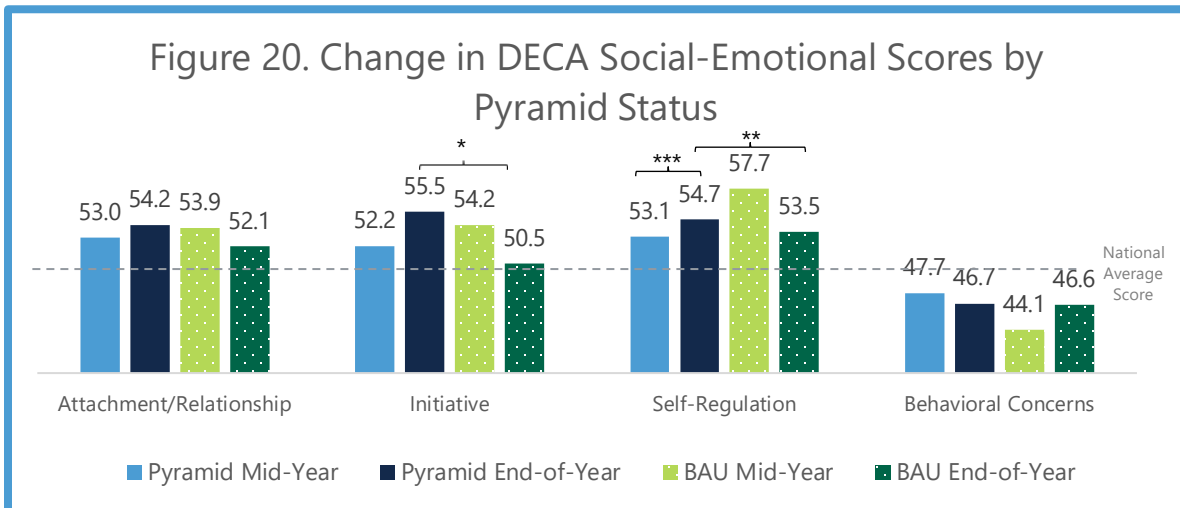
Finally, teachers in both settings were experienced with an average of 16-18 years teaching any age and 11-13 years teaching children in the birth through kindergarten age range (Figure 19).



Pyramid versus Business-as-Usual Classrooms: Child Outcomes

Research Question 2: Do children enrolled in classrooms where the Pyramid Model is implemented demonstrate improved levels of social-skills and behavioral regulation and reduced behavioral concerns?

Teachers in Pyramid and Business-as-Usual Classrooms reported on children’s social-emotional skills using the DECA P-2 at mid-year and end-of-year. All students scored in the average range, with scores around the national mean (score of 50). See Figure 20. With that in mind, children in Pyramid classrooms were perceived by their teachers to have more positive social-skills at end-of-year than mid-year.



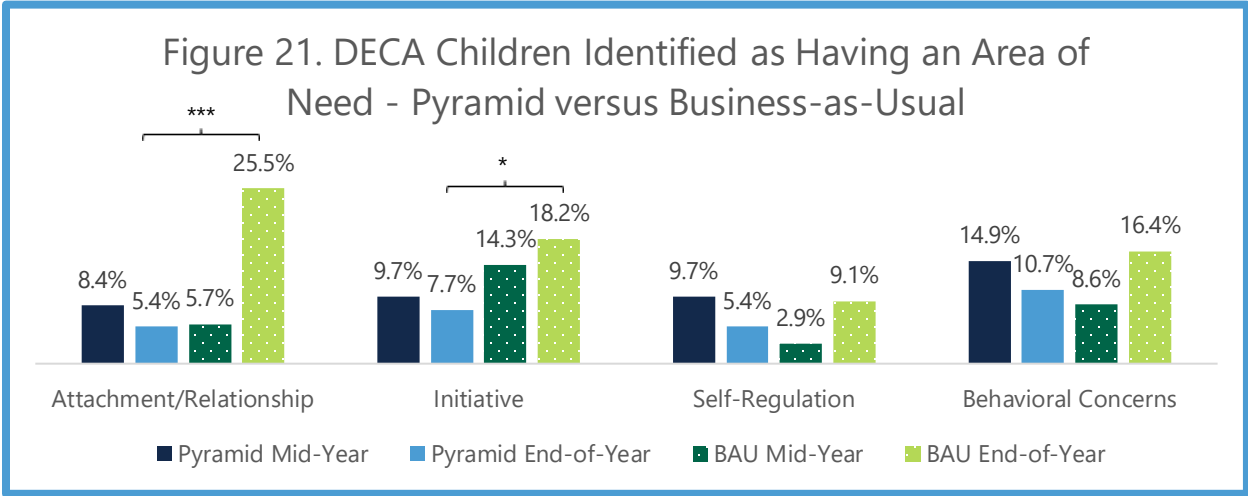
Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

These differences were in the small to moderate range for Pyramid classrooms for the Initiative and Self-Regulation DECA scores. Initiative is defined as showing confidence, persistence, problem-solving, inquisitiveness, and initiative.

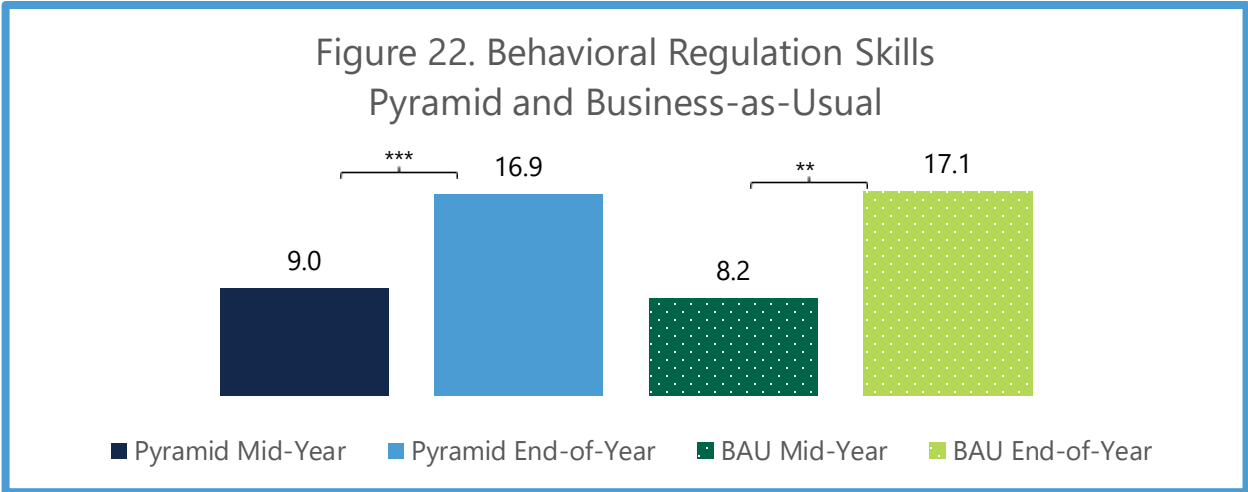
Scores were stable for Attachment/Relationships with the teacher and Behavioral Concerns in Pyramid Classrooms. In comparison, Business-as-Usual classrooms showed small drops in teacher-reported social skills through the school year on Attachment/Relationships, Initiative, and Self-Regulation and small increases in Behavioral Concern ratings.

“Many of my students are going through the problem-solving steps with minimal teacher support.”

Fewer children enrolled in Pyramid classrooms were scored as having behavior in a range that would qualify them for referral for additional services in the areas of Attachment/Relationships and Initiative relative to Business-as-Usual Classrooms by the end-of-year assessment (see Figure 21).



Business-as-Usual NC Pre-K teachers reported a higher proportion of children as having difficulty forming relationships with adults (25%) and rarely or never showing initiative in their classroom behavior at the end of the year (18.2%). These scores are considered to be meaningful as a clinical tool for identifying children who need additional services in these social skill domains. This difference in children identified for referral related to



Attachment/ Relationships is considered to be a meaningful difference with a moderate effect size ($d = 0.46$). Differences were also moderate in size related to rarely or never showing initiative ($d = 0.27$). Behavioral concerns as an area of need was identified *Notes*. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

for 1-3 children on average across Pyramid and Business-as-Usual classrooms with a higher proportion identified in Business-as-Usual classrooms at both time points.

Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Children's behavioral regulation skills as measured by a "Simon Says" type of behavioral inhibition assessment showed growth from mid-year to end-of-year. However, there were no meaningful differences between children enrolled in Pyramid and Business-as-Usual classrooms at end-of-year. See Figure 22.

We also tested these patterns using an analysis approach that would allow us to examine the degree to which the descriptive patterns above would still be seen if we were able to account for differences between two groups of classrooms on other teacher and classroom characteristics. For example, if we held the years of experience of the teacher constant would we still see differences in classroom practices or did the differences between the two groups reflect one group being more experienced than the other overall rather than participation in the Pyramid Model? This additional rigorous analysis was estimated using multi-level regression models. The DECA Initiative results were robust with the addition of teacher and classroom control variables to the regression models (allowing us to examine whether the differences really were due to participation in the Pyramid Model and not other factors). We found that fewer children enrolled in Pyramid classrooms were scored as having concerning behavior requiring a referral for additional services (6% need referrals; *odds ratio* = 0.99). Also, Business-as-Usual NC Pre-K teachers reported a higher proportion of children as rarely or never showing initiative in their classroom behavior at the end of the year (20% of students likely needing referrals). The differences in behavioral concerns and child initiative are considered to be a difference related to Pyramid Model participation and because of other differences between the two groups, also reflecting a result that is statistically significant (not likely due to chance) and the differences that were large enough to be considered meaningful (not just small results where changes wouldn't make much difference for teachers or children; with a moderate effect size of 0.31).

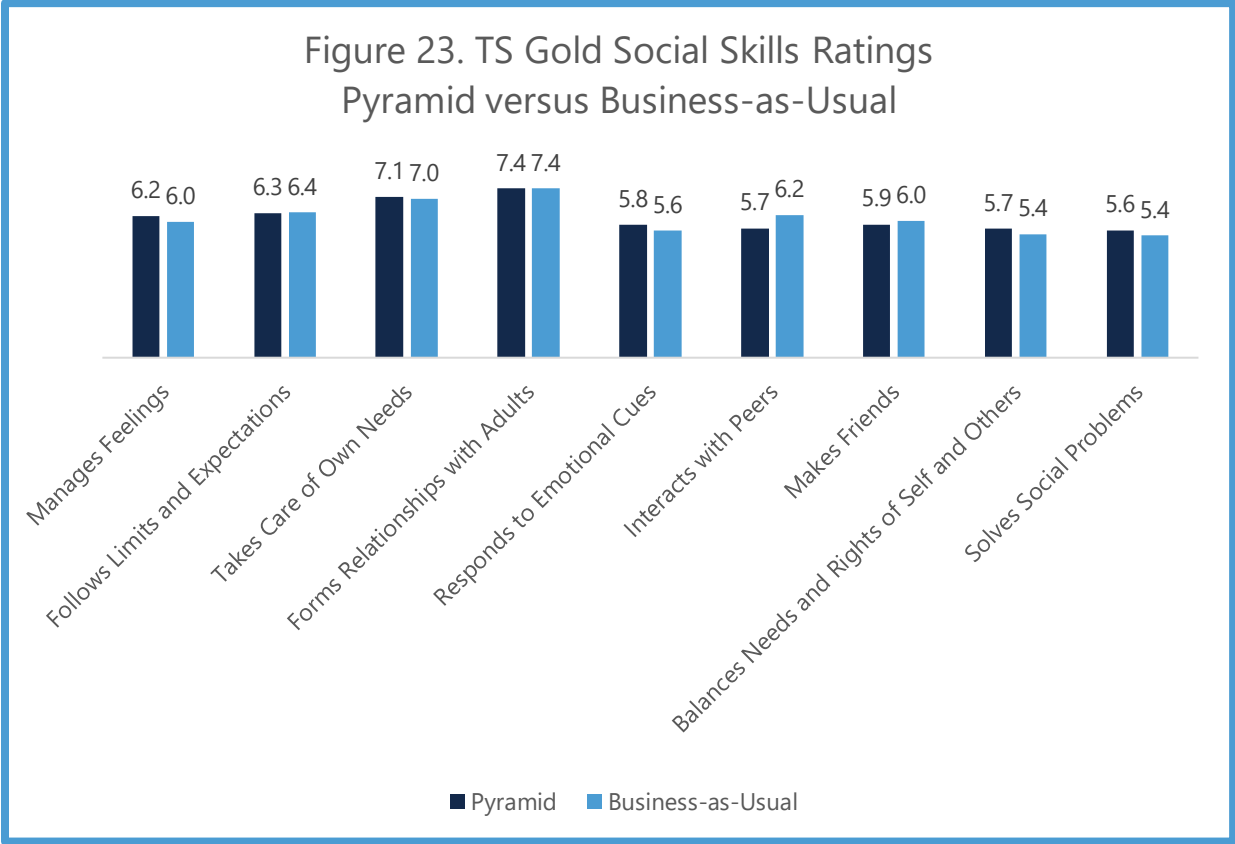
Although not a specific focus of this study, our results also confirm previous studies showing positive associations between teacher-child interactions and growth in children's social outcomes. In this case, CLASS Emotional Support is significantly predictive (positive) of DECA Attachment/Relationship T-scores. These findings indicate

that teachers in classrooms where warm and sensitive behaviors were observed more frequently also reported that children were more likely to demonstrate prosocial behavior toward their peers, teachers, parents, and/or other adults.

“The children are using their friendship skills in relating with peers. They are accessing our solution suitcase to solve social conflicts. They are able to identify emotions and make themselves or others feel better.”

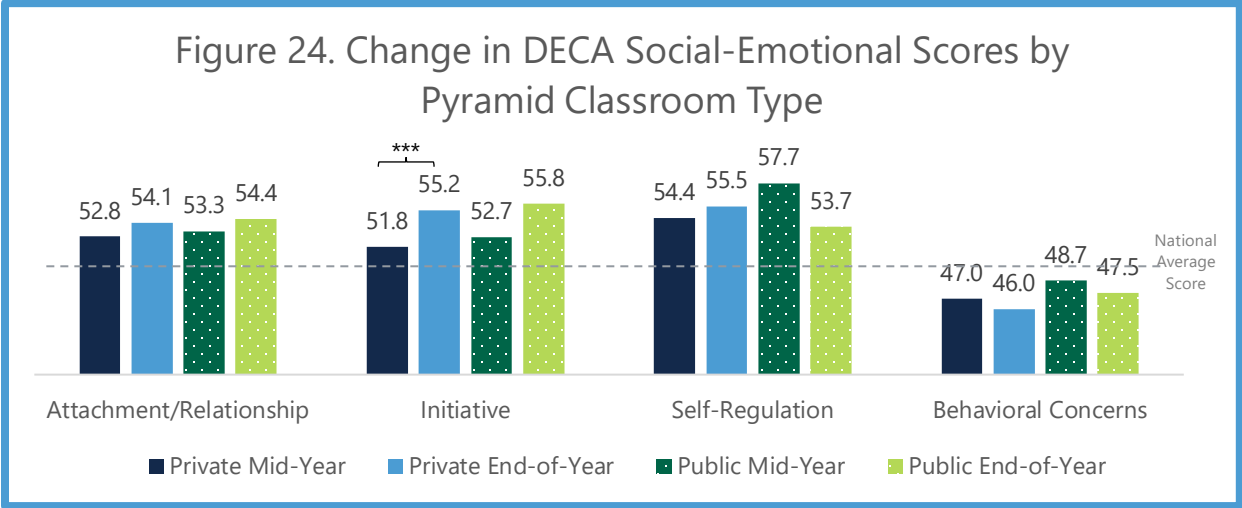
Technical Note: To examine the association between classroom features and children’s end-of-year assessment scores, we estimated two-level lagged-regression models with children nested within classrooms. We included child and family demographic variables as covariates to address any potential selection bias of children into centers and classrooms. Although our sample was randomly sampled from children within classrooms with permission to participate, they were not randomly assigned to the tested conditions. Our regression estimates do include strategies to minimize the influence of interference related to factors known to be related to differential enrollment into classrooms. For example, we included mid-year assessment scores as a covariate in each model to account for baseline differences in assessment scores and to allow parameter estimates associated with Pyramid participation and program auspice (public/private) to reflect differences related to these parameters rather than preexisting differences between children. Also, we were not able to examine the Area of Need score for DECA Self-Regulation in the regression analyses because few children were identified as having this as an area of need (1 child in the Business-as-Usual group and 8 children in Pyramid classrooms).

Teachers in Pyramid and Business-as-Usual Classrooms also reported on children’s social-emotional skills using the Teaching Strategies GOLD formative assessment system. On average, NC Pre-K teachers in Pyramid and Business-as-usual classrooms reported that children had made progress toward meeting kindergarten expectations along this 10-point scale from “not yet” (Level 0) to “exceeds kindergarten expectations” (Level 9; see Figure 23). For example, the highest average score was 7.42 for the item indicating that children form relationships with adults. The lowest average score was 5.50 for the item indicating that children solve social problems. On average, Pyramid teachers reported similar or higher scores than Business-as-Usual teachers across all nine items from Teaching Strategies GOLD Social-Emotional Scale.



Pyramid Public versus Private Classrooms: Child Outcomes

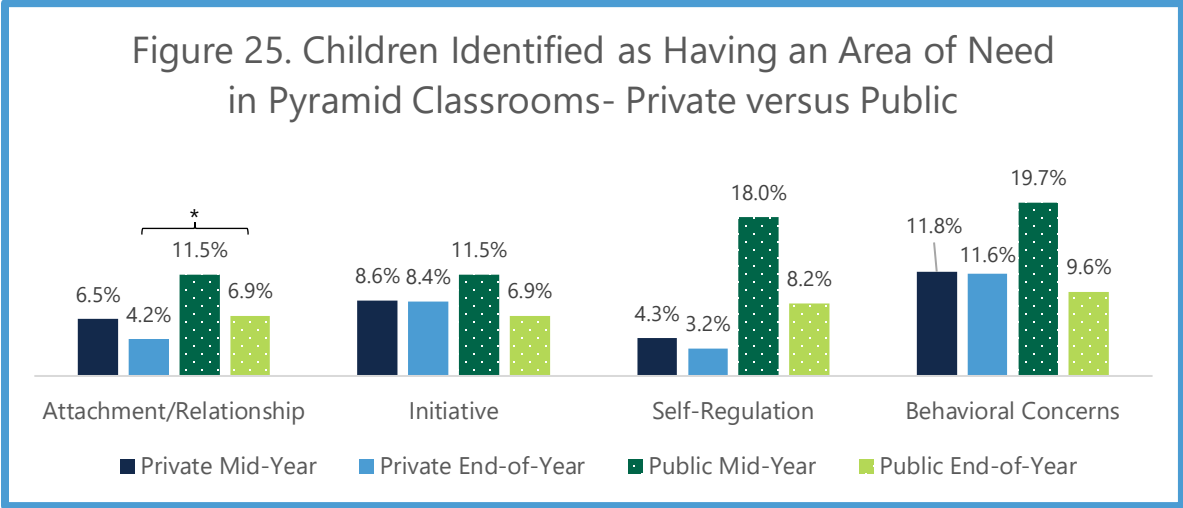
As presented previously, teachers reported on children’s social-emotional skills using the DECA P-2 at mid-year and end-of-year. This section compares scores for children enrolled in different classroom settings for all participating Pyramid classrooms. All students scored the average range, either having average scores above the national mean (score of 50) on the positively rated skills or below the national mean on the Behavioral Concerns scale. See Figure 24. Children enrolled in Pyramid classrooms located in public schools and private center-based settings had social skills that were rated similarly by their teachers at the end-of-year assessment. Children enrolled in private center-based Pyramid classrooms were perceived by their teachers to have somewhat more positive social-skills in the area of Initiative at end-of-year than mid-year. Other social skills did improve from mid-year to end-of-year but did not meet statistical levels of significance.



Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

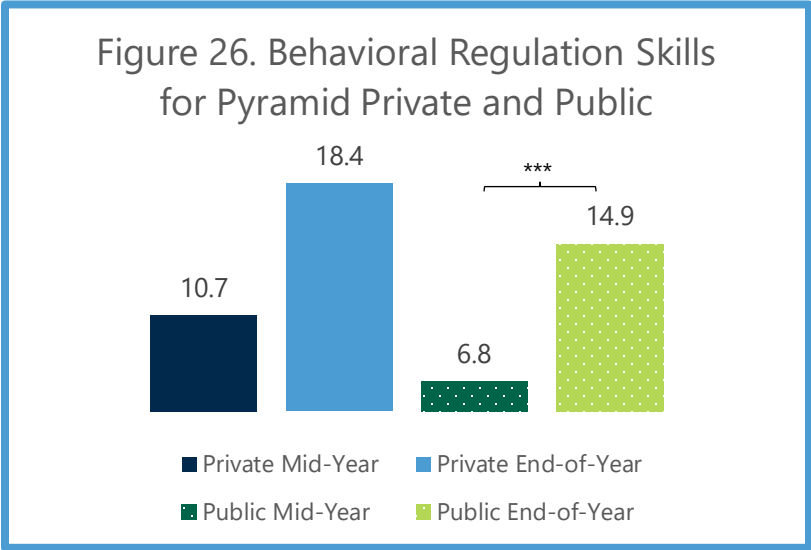
Overall teachers in Pyramid classrooms located in public school settings rated the children enrolled in their classrooms as having more positive social skills and fewer behavioral concerns at mid-year than end-of-year (see Figure 24). Behavioral concerns as an area of need were identified for 1-3 children on average across Pyramid classrooms located in private center-based and public school settings. A higher proportion of children on average were identified in public school classrooms as having attachment/relationships in a concerning range (see Figure 25).

“Students are entering Pre-K with limited social emotional development and severe behavior challenges. Many parents need resources and tools to understand the importance of supporting their child's social/ emotional needs to promote school success.”



Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

There were no meaningful differences in behavioral regulation skills between children enrolled in Pyramid classrooms located in private center-based and public school settings at end-of-year. See Figure 26. Children enrolled in public school Pyramid classrooms were assessed as having lower scores overall than children enrolled in private center-based settings, but they also showed meaningful growth in this skill area from mid-year to end-of-year with a large effect size ($d = 0.86$).



Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TS Gold data could not be broken down by private and public settings in our dataset so were not compared.

Results From Process Evaluation Study

Research Question 3: What factors were identified by Pyramid stakeholders as facilitators and barriers to implementing the Pyramid Model to fidelity?

The RE-AIM framework can be used to evaluate the outcome and implementation of the Pyramid implementation study through the following dimensions: Reach, Effectiveness, Adoption, Implementation and Maintenance. Dimensions Reach and Effectiveness evaluate components of the intervention based on who the intervention is meant for and who it reaches, as well as the effectiveness of the benefits it intended to make. Dimensions adoption, implementation and maintenance evaluate the implementation strategies based on where it was applied, how the implementations were delivered and when the intervention was made operational or whether the results of the intervention were sustained.

Reach

The reach dimension evaluates who an intervention was developed for and whether or not that population got access to the intervention. The Pyramid Model was developed for the teachers to better serve children in their classrooms. It was implemented in pre-K classrooms where teachers signed up to participate in the model. The coaches and teachers reported that information about the Pyramid Model, the Pilot in Pre-K, and supporting materials and strategies were shared peer-to-peer between teachers, in county and coaching newsletters, and via the coaching network. Some of these sources were identified as the National Center for Pyramid Model Innovations (NCPMI), Wake-Project Enlightenment (a community partnership center for teacher and parent supports) and the Early Learning office (behavior CT and coordinating teacher support). Given the directed pilot nature of this project, reach was restricted to the counties involved and programs selected to participate.

Effectiveness

The implementation of Pyramid model showed effectiveness in improving child outcomes by providing them skills to navigate and solve their own problems. The PM also enabled teachers to feel more confident in their ability to provide support to the children in their classrooms. Below are results from the focus groups regarding effectiveness of the Pyramid Model Implementation.

“[We are] providing children with choices and language needed to express their needs.”

Child Outcomes

Teachers and administrators believe that **children have strategies to solve their own problems** as a result of the support provided through the Pyramid Model coaching. Here are some specific examples.

Problem-solving strategies are modeled in the classroom (by peers and teachers) and are encouraged to be replicated at home (with parents and siblings). An administrator stated, *“We’ve seen an increase in peer-peer solving conflicts since they know how to problem-solve on their own. The lean towards Pyramid Model was the most impactful way that’s come about, rather than the school system. Students’ skills coming into the classroom need help; positive corrections and support for helping students use the communication skills works.”*

Administrators and teachers recognize clear benefits of the Pyramid model on children’s social and emotional regulation, as this administrator explained, *“It has had a significant impact on our children. I can see a noticeable difference in how children are better able to handle stresses of the day. We see fewer moments of dysregulation among the children...My teachers have seen the value in implementing the Pyramid Model and they have seen the outcomes.”*

And teachers see the Pyramid resources help children learn coping skills and improve peer-regulation.

“It has had a significant impact on our children. I can see a noticeable difference in how children are better able to handle stresses of the day. We see fewer moments of dysregulation among the children...My teachers have seen the value in implementing the Pyramid Model and they have seen the outcomes.”

When teachers were asked an open-ended survey question about what is working well with supporting children’s social-emotional development and/or the Pyramid Model in the classroom, Pyramid Model teachers noted that they are using the strategies taught

by the Pyramid Model themselves and they see children using the strategies independently and with other children. Teachers expressed gratitude for having access to a Social and Emotional Foundations for Early Learning (SEFEL) Coach. They were teaching children calming strategies, how to describe their feelings, how to use the classroom safe space to calm themselves and how to use breathing techniques to calm down. In this model teachers said that they emphasize emotions, friendship skills, problem solving, communication skills and use many visual tools. One Pyramid Model teacher said it was important to *“Have a high-quality environment that promotes positivity. In the common corner, the space to vocalize their emotions without being criticized.”*

Teacher Outcomes

Pyramid coaches have identified several strengths of the Pyramid Model (PM) implementation.

One commonly noted strength of the Pyramid Model is that it is successful in increasing **teachers’ confidence** to support children’s social-emotional needs.

In one focus group, a coach said, *“The first year it seems like extra work.”* Another coach agreed and added, *“The teacher will start using Pyramid Model (strategies) automatically the following year. They think it’s just a calmer group of kids – it’s not, it’s they’re teaching them how to be more self-sufficient with their emotional needs right from the beginning so that they don’t have the problems that they have to fix (later).”*

In the focus groups and interviews, teachers reported that they feel **more confident and better able to give individual feedback** on children’s social and emotional learning needs.

“Echoing on others, the training opened eyes as to how teachers carry themselves in the classroom, and about not expecting too much from them until the students have the social emotional skills developed.”

Teachers also told the interviewers that they feel more capable of leading from the front; they are better able to take on more difficult tasks to take pressure off other staff members.

As a result of the Pyramid Model, teachers are reportedly **spending more time on supporting child development and classroom instruction and less time on behavior problems** and disruptions. When asked what is working well with the Pyramid Model, one coach said, *"Problem-solving cards and practices. Interesting to see that the teachers are not having to teach it anymore by the end of the year – the children just practice it. It is encouraging to see that this really works."* Coaching is reported to have improved teachers' confidence in addressing disruptive behaviors and managing difficult situations in the classroom. Teachers reported being prepared with resources to utilize in advocating for themselves and their students which has improved teacher preparedness and readiness to enhance their skills.

The Pyramid Model has afforded time for **community of practice** discussions with other teachers and teachers within the same schools have increased concordance in their responses to their children and relationships with one another. Pyramid Model coaches reported that teachers are talking to each other about the Pyramid Model even if they are not all participating. *"We have things in place as a district that we always get high-fives from teachers. We do an end of year survey about our whole program and universally they want to keep what we call the SEFL huddle. Teachers say if you have to get rid of something don't get rid of this. It's because it's led by their peers, and they get to hear from their peers. We have PLCs but this is different. This specifically focuses on Pyramid Model and social-emotional learning and it's just teachers."*

Adoption

The pilot program was adopted in participating NC Pre-K classrooms. Teachers were provided coaching provided through the Pyramid model coaches. Their observations of children's behavior and needs, as well as resources were then shared with parents to increase family engagement. We also want to note that the results of this study do not reflect adoption in all NC Pre-K classrooms, so this report only reflects short-term adoption within the context of the pilot.

Meaningful Family Engagement

The Pyramid Model has helped administrators and teachers to **build authentic relationships with families/guardians**. A Pyramid coach explained that *"the mindset the Pyramid teachers have around families shifts from 'what can I give my families?' to 'how can I support my families?'"* Teachers report that they attempt to reach out to every

caregiver rather than just the caregiver who was easiest to reach – for example, they used Google Translate or Facebook Messenger to converse with parents and/or caregivers who don't speak English (a process co-created based on the caregiver's preferred mode of communication). Teachers noted the impact of these efforts to communicate with caregivers despite a language barrier. One teacher said, *"I think it definitely makes a difference, socially, you know that's how they feel if they can talk to us or not."* Additional examples are provided below:

Administrators and teachers reported sharing general resources with families on how to support social and emotional learning (SEL). This kind of sharing was *"... a really simple thing for parents, that might not necessarily have an educational background, but simple things that they could do to help their child and with their social emotional development."*

Another teacher commented, *"I try to communicate things in a variety of ways to make sure that the parents know what's going on, and I give multiple opportunities to be a part of the class, and I try not to be too specific when I'm asking for involvement; if I leave it a little more open ended, then I think parents maybe feel a little more interested."*

Teachers believe that *"when you know what's going on at home... when you build that relationship, you know the family is more apt to tell you what's going on."*

"To me, one of the main and the most foundational things that you can do in the classroom is build that rapport in that relationship with the families."

Modelling communication for the students was a feature of meaningful family engagement as well. One teacher stated, *"I think when a child sees that 'okay, my parents can talk to my teacher, so I can too'... 'they're safe with them so I'm safe too.'" and "When they see that you know okay well they're trying to communicate with us, they're trying to get to know us, you know they care, I think that you see a difference in the kids."*

The administrators and teachers remarked that parents **enjoy hearing positive feedback about their children's behavior** and seeing the progress they're making in the classroom. One example offered was a teacher who had established a Zoom feed for parents to directly see what's happening in the classroom.

One administrator reported that their teachers *"Have seen increase in communication, especially about more mundane things...kids share, play, etc. more with teacher, but are*

not having meltdowns; parents are glad to hear good things, since things may not be going so well at home. (Parents assumed the way things were going at home were happening at school.)"

The importance of meaningful communication given the repercussions of the COVID-19 pandemic was also discussed. For example, one administrator noted that parents had extremely limited access to their school building due to safety restrictions related to COVID-19.

"Parents can't come in the building; kids have lot of meltdowns in lobby...especially the first couple weeks of school. We have to have communication, so parents know it's not happening after children come inside classrooms. I see teachers using Pyramid Model ideas in class and in communication with parents."

Parents of children enrolled in Pyramid classrooms described positive impacts on their children's development as a result of Pyramid-related practices. Teacher's use of resources and specific strategies stood out for parents, such as teacher use of online resources available through the "Ready Rosie" website. Teachers also taught breathing techniques to help children regulate their emotions. Parents observed a growth in their children's ability to identify and regulate their emotions independently and had a positive orientation towards the Pyramid program. Parents noted that they themselves have learned from their children's Pyramid resources on their own emotional regulation. As a couple of parents described:

"I could see the change in him (child) which is helping to interact socially with other people, and that's really good."

"He (child) comes home and tells the stories like what the teacher tells them, and you know, he comes and tells me how I should control my own emotions."

Implementation

In participating NC Pre-K classrooms, directors, teachers, and Pyramid Model coaches described the implementation of the Pyramid Model in North Carolina as having the following characteristics:

Training & Coaching

Participating teachers are trained to fidelity using the Teaching Pyramid Observation Tool (TPOT)^[11]. The parameters for fidelity are "80% or greater average score across all the key practice areas, no red flags, minimum 70% in each key practice, essential

strategies used to respond to challenging behavior”, on at least two observations. The TPOT is used to guide coaching throughout the school year. The frequency of coaching is unclear according to the different perspectives from which data were collected, but the frequency of one-on-one coaching appears to range from once a week to once per month.

Tangible Materials

Coaches reported several tangible materials that were given to teachers as part of participation in the Pyramid Model. Social Emotional Foundations for Learning (SEFL) kits include items for students such as books, Tucker Turtle, fidget toys, sensory toys, conscious discipline pillows, and timers that aid Pyramid Model implementation. The “Calm Down Kit” includes tools that teachers can periodically rotate in the classroom for children to use freely in the “cozy corner”. For teacher use, Pyramid coaches shared printed materials such as books on challenging behaviors, feelings charts and wheels to hang on the wall. Coaches reported that lamination for printed materials is available free of charge in some counties. In one county, the Social-Emotional lending library is available to all teachers, not just those participating in Pyramid Model.

Teachers also expressed a range of responses when asked about other social-emotional and/or behavioral supports or resources they needed. They would like to have access to more SEL training for themselves and teaching aides, more material resources such as age-appropriate books related to social emotional/ behavioral topics, and more planning time. One teacher stated *“I wish I had consistent help in the classroom. Having a second person in the classroom helps not only the children but helps the teacher manage behaviors or social-emotional management too.”*

Peer-to-Peer Strategies

Communities of practice within schools are a major resource for teachers participating in Pyramid Model coaching; providing time for teaching teams to discuss plans, successes, and challenges with implementing the Pyramid Model. In one county, prior to adopting the Pyramid Model in their classrooms, teachers are invited to observe the implementation of Pyramid Model strategies in the classroom. During the first training, a fellow teacher gives a presentation on how they use Pyramid strategies in the classroom. Some coaches also offer “SEFL Huddles” twice per year where teachers who are newly coached and those who recently reached the fidelity stage come together to plan activities for their classrooms.

Individualizing Strategies

Individualization for specific children's needs was reported as a key component of the Pyramid Model. *"Some teachers will have three different schedules in their classroom to meet the needs of the children."* Teachers will also individualize materials for families. For example, teachers can choose "Ready Rosie"^[1] videos through a web-based platform that has resources for working with families. Teachers also have other professional development resources.

Family Engagement

Another key component described by coaches, teachers, and administrators was family engagement. During the first parent-teacher meeting of the year, some teachers will share the SEFL materials.

Maintenance

Maintenance refers to a program's ability to sustain results. Since this was an initial pilot study, results regarding maintenance were not tested and could only be explored hypothetically by participants. Within that context participants discussed their anticipated needs to be able to effectively implement and maintain the results that they had started to observe.

In discussing the challenges faced by teachers, teachers cited a **need for planning time and resources** in order to successfully incorporate the strategies being offered under the Pyramid Model.

When asked about what is needed to successfully implement the Pyramid Model, one administrator said, *"monetary support...my teacher has many other duties in addition to the Pyramid Model. She sees value in the Pyramid Model, but at the end of the day, you've got one more thing to do, and I don't want to see it become a 'check box' for her. More intrinsic rewards to assist teachers would be good but may be beyond scope of the Pyramid Model."*

Barriers to implementation of Pyramid strategies in the classroom also included not having enough teacher-coach time nor protected planning time for teachers, which would require an increase in staff.

“Providing materials without coaching doesn’t work. Coaching is required to integrate on teacher’s behavior and need to see someone modeling and supporting through the process.”

Coaches have also noted **difficulties coordinating** Pyramid Model **strategies and practices across support staff**. Support staff could include a team of physical therapists (PTs), occupational therapists (OTs), behavioral therapists, speech and language pathologists, afterschool teachers, paraprofessionals or one-on-one aides, and others. It can be difficult to coordinate with large teams such as these, and as a result there is the potential for multiple support people to provide conflicting advice on the same child to the child’s teacher.

A desire for a **more cohesive Pyramid Model curricula** with sequential sessions that build upon previous sessions in an intentional way was also expressed by administrators and teachers. For example, a higher degree of consistency would allow for more transparent expectations of participating in Pyramid Model coaching, such as, “What does coaching look like?”, “What are the number of sessions?”, “How is the content/focus of coaching sessions determined?”, or “How is coaching delivered?”. Providing a clear framework to teachers and administrators about expectations of participation in Pyramid Model coaching may alleviate concerns about expectations.

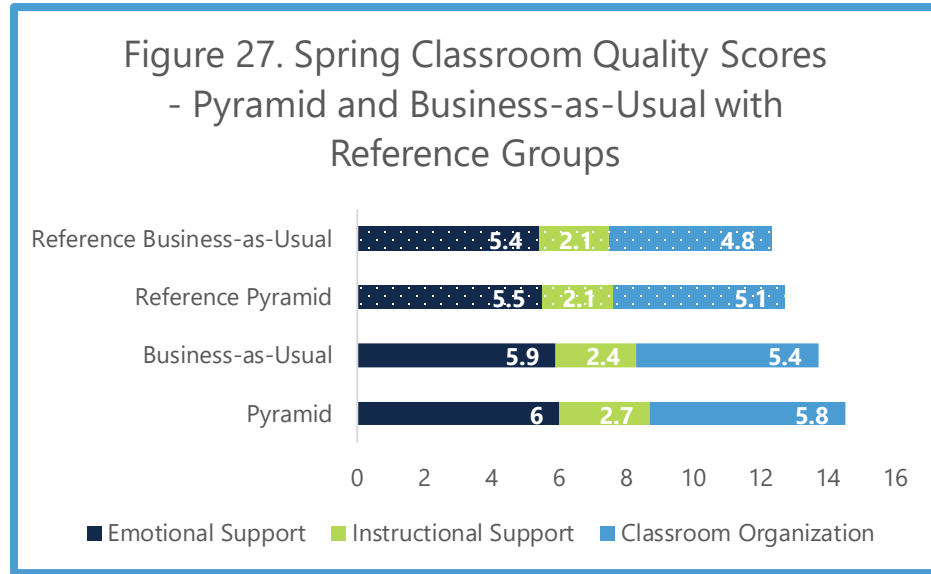
Summary and Discussion

This outcomes and process evaluation study of the pilot implementation of the Pyramid Model social-emotional coaching program in NC Pre-K classrooms yielded positive outcomes relative to classrooms where the Pyramid Model has not yet been implemented. A summary of the results of this study is provided below.

Pyramid Model versus Business-as-Usual Classrooms

Teacher-child interactions Pyramid Model classrooms generally started in the moderate to high-quality range and showed stable scores or improvements from the middle of the year to the end of the year on observations of the quality of teacher-child interactions.

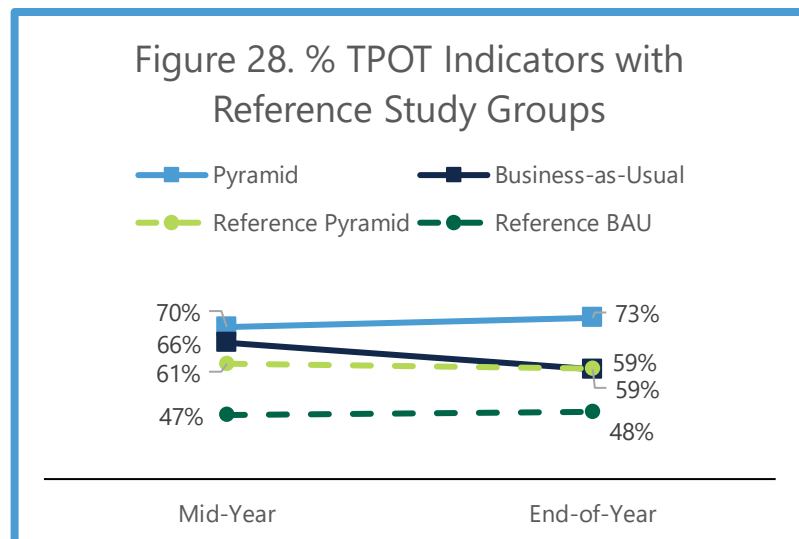
Classroom quality was observed to be in the moderate to high-quality range for Emotional Support, Classroom Organization, and Instructional Support. Classroom quality



scores were observed to be in the high-quality range and similar but slightly higher at the end of the school year than classrooms that previously participated in a study of Pyramid Model implementation (Hemmeter et al., 2016; see Figure 27).

Use of evidence-based practices Teachers participating in the Pyramid Model coaching program had higher TPOT fidelity measure scores at mid-year and end-of-year than Business-as-Usual classrooms, although all classrooms improved by the end of the year. TPOT fidelity

measure scores reflect the use of evidence-based-practices known to support children’s social-emotional development. The proportion of TPOT indicators implemented to fidelity were higher in our study than in previous studies of the Pyramid Model where the TPOT was collected at similar



times of year (Hemmeter et al., 2021; see Figure 28). The Pyramid Model classrooms met an average of 73% indicators at mid-year and 73% at end-of-year, whereas the Pyramid Model classrooms observed in that study were at 60% and 59% at those respective timepoints. Our Business-as-Usual NC Pre-K classrooms also scored higher than the Pyramid classrooms in the reference study at mid-year (66%) but were observed to be meeting similar standards as the reference study Pyramid Model classrooms by end-of-year (59%) without any coaching. Another study showed lower mid-year scores for their Pyramid-participating classrooms but similar end-of-year scores to our sample (Hemmeter et al., 2016). Red flag scores at baseline in previous studies ranged between 3-4; the Pyramid Model classrooms in this study were below that level and the Business-as-Usual classrooms were much higher at end-of-year (Hemmeter et al., 2018).

Observed Social-Emotional Activities About half of Pyramid and Business-as-Usual classrooms had observed activities that support children’s social-emotional development during at least one CLASS observation cycle. The proportion increased from mid-year to end-of-year and was higher in Pyramid than Business-as-Usual classrooms. However, 30% of Pyramid classrooms and 44% of Business-as-Usual classrooms were not observed to have observed social-emotional activities by the end of the year.

Observed Classroom Red Flags “Red flag” counts by the TPOT observers were similar in Pyramid and Business-as-Usual classrooms at mid-year and stayed stable until the end of the year for Pyramid classrooms. However, the number of observed red flag behaviors more than tripled in Business-as-Usual classrooms by the end of the year. These observed increases are concerning as they reflect ineffective use of space, lack of independent child engagement with materials, or observed incidences of challenging behavior for children. The results of this study suggest that Pyramid Model coaching may serve to reduce the number of red-flag instances in NC Pre-K classrooms.

Children enrolled in Pyramid Model versus Business-as-Usual Classrooms

Key participants viewed the implementation of Pyramid model as effective in improving child outcomes. They felt that they were better able to facilitate children’s ability to independently navigate and overcome challenges. The mechanisms by which this took place was that teachers felt more confident in their ability to provide social-emotional guidance and support to the children in their classrooms. As a result, teachers who participated in the Pyramid Model felt that they were able to spend more time on supporting children’s learning and development rather than being pulled away to

handle behavioral disruptions in the classroom. The outcomes study found the following:

- Children enrolled in NC Pre-K classrooms in this study were rated as having social skills that were rated slightly more positively than the national average for children of the same age.
- Children enrolled in Pyramid Model classrooms were rated as demonstrating more initiative at the end of the year than children enrolled in Business-as-Usual classrooms.
- The proportion of children who scored in a clinical range as an area of concern related to behavioral concerns was high across classrooms but increased more and was slightly higher at the end of the year in Business-as-Usual classrooms than Pyramid classrooms. Relationships with adults were also higher as an area of need in Business-as-Usual classrooms.
- Similar to a previous study of the Pyramid Model, children improved in their behavioral regulation/impulse control skills from the middle of the year to the end of the year in both Pyramid classrooms. In previous research skills only improved for the Pyramid classrooms and not Business-as-Usual classrooms; however, in this study we saw improvements in children's social skills in both (Hemmeter et al., 2021).
- TS GOLD scores were also similar between Pyramid and Business-as-Usual classrooms.

Pyramid Model Public versus Private Classrooms

Pyramid classrooms located in public school classrooms had slightly higher scores across time-points on their observed classroom quality than Pyramid classrooms located in private center-based settings. There were differences on the TPOT fidelity of implementation measure where classrooms located in public schools were observed to implement a higher proportion of evidence-based practices at both time-points, and in a range that would reflect implementation to fidelity (80% or greater). Although, these rates of implementation to fidelity were higher than the public school scores reported in Hemmeter and colleagues (2021). Teachers in Pyramid classrooms located in private center-based settings often had early childhood degrees and held a master's degree versus teachers in classrooms located in public schools who had a non-education major more frequently and more often had bachelor's degrees as their highest level of education. Children enrolled in public school Pyramid classrooms had better ratings on their relationships with adults at the end of the year than children enrolled in classrooms

located in private center-based settings. They also showed more growth from the middle of the year to the end of the year related to their assessment behavioral regulation skills.

The students feel empowered when they can solve problems with limited adult's assistance.

Implementation

Overall, there is evidence from this study that the Pyramid Model was able to be effectively implemented to fidelity in some Pyramid classrooms in both classrooms located in both private and public settings. Teachers and administrators also reported that they have more positive relationships with families/guardians as a result of participating in the Pyramid Model. These positive relationships were facilitated by the teacher's improved ability to observe children's positive and negative behavior, communicate about it regularly and effectively with families, and to be able to offer social-emotional supports to families.

Three key barriers to implementation also emerged. Pyramid Model teachers cited a need for more: (1) planning time, (2) resources, and (3) a desire for a more cohesive Pyramid Model curricula to supplement the available coaching and to allow a greater number of staff and support personnel to learn the evidence-based practices promoted as part of the Pyramid Model.

After the conclusion of this study, a mechanism for sustaining the benefits of Pyramid Model participation and to monitor the need for additional implementation could be through the collection of routine data related to social-emotional functioning for children enrolled in NC Pre-K classrooms. A dashboard style tool could utilize metrics that are routinely collected by programs that house NC Pre-K classrooms but not always reported or compiled at the state-level, such as:

- Children's attendance records as a means to identifying children who have high-level of absences as a potential sign of difficult life circumstances that may result in social-emotional distress for children and their families.
- Monitor formal and informal expulsion rates as there is evidence from another state that scaling the Pyramid Model can help with reductions in expulsion rates (Vinh et al., 2016).

- Offer an anonymous survey about out of school suspensions and in-school suspensions.
- Indicators from the Early Learning Inventory may be relevant to identifying children in distress.
- Track the proportion of children who have a known experience in NC pre-K as an indicator of the proportion of eligible children who have access to NC Pre-K as a social-emotional intervention prior to school-entry.

Finally, written implementation plans that provide guidance related to initial and ongoing professional development, personnel competencies, and follow-up to ensure that fidelity to the Pyramid Model is maintained. These plans should also include planned intervals for assessing the degree to which implementation reflects “values/beliefs, concerns and strengths, and input from all stakeholders” (Mincic, et al., 2022).

Conclusion

Overall, the study findings were slightly more favorable than in previous studies of implementation of the Pyramid Model. This difference might be explained, at least in part, by the lack of randomization in our study. It is likely that the counties and the specific NC Pre-K teachers who participated in the Pyramid Model coaching or Business-as-Usual were more ready to implement than might be observed if randomization might have been possible. As such, slightly attenuated positive results related to the Pyramid Model might be likely if the Model were implemented at scale in North Carolina. This also reflects the demands on the time and resources of NC Pre-K teachers is vast, particularly as staffing has become an increasing challenge. In summary, the implementation of the Pyramid Model in private center-based settings was found to be related to more effective teaching practices for supporting young children’s social-emotional development, reducing the proportion of children that might be identified for additional services, and improving children’s confidence and independence in NC Pre-K classrooms. Scaling of the Pyramid Model shows promise in accomplishing intended outcomes for children statewide, but only if sufficient staffing, time, and resourcing are in place.

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Appendix Figure 1. Pyramid Model Evaluation Study
 North Carolina Pre-K Program Pyramid Model Implementation Theory of Change

