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Academics of the Early Primary Grades: Investigating the Alignment of Instructional Practices from Pre-K to Third Grade

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ABSTRACT

Research Findings: The present study examined the extent to which instructional practices, including curriculum, in pre-K through third grade are vertically aligned. Attention was directed to teachers' grouping practices, academic content, and pedagogical methods given their importance for students' learning. Variable- and person-centered analyses examined these practices for a sample of 1,095 students in 179 pre-K through third-grade classrooms. A comparison of practices indicated that pre-K practices were significantly mis-aligned from those used in kindergarten through third grade, whereas kindergarten practices were well aligned with practices used in the older grades. Examination of profiles of classroom practices showed there to be four profiles, one of which was considered as "academic-light group work," which was dominated by pre-K and kindergarten classrooms. *Practice or policy*: Overall, this study found that instructional practices in pre-K were starkly different from those in kindergarten through third grade, and that kindergarten appears to be highly academic for about two-thirds of classrooms. This work underscores the importance of practices and policies that promote alignment from pre-K into the primary grades and how it might be enhanced.

Given the sheer volume of time children spend in classrooms, there is keen interest in learning about children's instructional experiences in these settings, including their exposure to specific grouping practices, academic content, and pedagogical methods. From a theoretical perspective, these three characteristics of teachers' instructional practices are often viewed as key mechanisms for development of children's academic and social-behavioral skills. For instance, teachers frequently use small groupings within the classroom as a means for differential teaching or social learning in the primary and later grades (Baines et al., 2003; Hong & Hong, 2009; Murphy et al., 2017). As another example, and with respect to academic content, studies in the area of reading achievement have linked the amount of instructional time spent targeting reading-related skills to children's gains in this domain (Connor et al., 2006); such research has contributed to efforts to specify the amount of time to be spent in content-area instruction, such as the 90 min per-day block often recommended for reading instruction in the primary grades (Torgesen, 2007).

Numerous studies have examined grouping practices, content, and pedagogical methods within the primary grades (e.g., Banes et al., 2018; Blatchford & Russell, 2019; Rissanen et al., 2019), yet little is known regarding the extent to which these instructional practices are aligned or not aligned across the early grades of formal schooling, comprising pre-kindergarten to third grade. Here we define alignment as the degree of consistency children experience as they move across the early grades (Vitiello et al., 2020), and it is generally accepted that vertical alignment can serve to buffer the challenges of transitioning each year into a new grade with new standards and expectations. Although much has

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been written on the importance of alignment (e.g., Stipek et al., 2017), empirical investigations designed to assess alignment, or lack there-of (misalignment; see Vitiello et al., 2020) are quite limited, and the few studies that have investigated alignment suggest that consistency may be quite low across the primary grades (Pianta et al., 2007).

Interest in researching and promoting pre-K to grade-three alignment in instructional practice and curricula, particularly around grouping, content, and methods, has emerged in recent years in part due to concerns about the diminishing benefits of pre-K over time (Bailey et al., 2017). The gains achieved by children as a result of one year of high-quality pre-K as compared with children without pre-K experience often attenuate over the next several years of schooling (e.g., Hill et al., 2015). Some speculate that this convergence may reflect a lack of alignment in instructional practices as children transition from pre-K into kindergarten and beyond (Engel et al., 2013; McCormick et al., 2019); for instance, children may develop complex understandings during a year in high-quality pre-K, only to receive instruction in basic skills in kindergarten, which could contribute to convergence.

Enhanced vertical alignment in instructional methods may help children more seamlessly transition across the grades and better serve to maintain learning gains from year-to-year. Vertical alignment between pre-K and kindergarten through third-grade settings would involve instructional practices and content being at least somewhere coherent across these four grades. However, it is also plausible that preschool programs may be quite distinctive from kindergarten to third-grade settings given that early educators may have distinct philosophies governing how young children should be taught (e.g., developmentally appropriate practice; Bredekamp & Copple, 1997). For instance, early educators may place more value on free time and play experiences than educators in the later grades. This may lead to differences in instructional practices in preschool versus K-3 settings.

Studies of instructional experiences across the early grades have brought attention to the increasingly academic demands of early-learning settings, particularly pre-K and kindergarten (Bassok et al., 2016; Markowitz & Ansari, 2020). Scholars have suggested that the federal No Child Left Behind (NCLB) accountability emphasis, including use of high-stakes testing, has heightened the focus on academic instruction in pre-K and kindergarten over the last two decades (Russell, 2007). Some evidence bears this out. For instance, Bassok et al. (2016) found that kindergarten teachers across the United States in 2011 reported spending more time teaching academic content than teachers in 1998, had higher expectations for children's academic-skill development, and allocated less time to non-academic subjects, such as art and music. The authors contend that kindergarten in 2011 generally approximates first grade in 1998, supporting the perspective that kindergarten has become increasingly academic over time. In turn, this may contribute to larger discrepancies between pre-K and kindergarten classroom experiences. Reflecting this possibility, Vitiello et al. (2020) found that kindergarten teachers spent four times more instructional time on language and literacy than pre-K teachers in the same district, indicating that kindergarten instruction was more academic than pre-K instruction, signaling a potential lack of alignment, according to the study authors.

Given the changing nature of the primary grades, the present study was designed to examine instructional practices across pre-K through third grade using observational research methods and a cross-sectional design. To date, much of the research on instructional practices had relied solely on teacher reports (e.g., Bassok et al., 2016; Blatchford & Russell, 2019; Chang, 2008; Markowitz & Ansari, 2020), which may not represent in sufficient detail instructional practices as experienced by individual children in a classroom. Therefore, we use direct observations of children's instructional experiences with regard to grouping practices, academic content, and pedagogical methods between pre-K through third grade. In doing so, we first examined grade-related differences in instructional experiences across these three dimensions (grouping, content, and methods), using a variable-centered approach, and then explored whether there were typologies of practices based on a person-centered approach. The variable-centered approach assesses the extent to which there are differences across the early grades in the three dimensions of children's academic experiences, which can serve to determine whether academic experiences are (or are not) vertically aligned. The person-centered approach provides a complementary approach for examining children's instructional experiences by determining

whether pre-K to third-grade classrooms exhibit specific patterns of practice when considering the three dimensions simultaneously. We also examined whether classroom- and child-level characteristics are associated with classrooms' profile membership, including grade.

Even though there are many dimensions of children's classroom experiences of relevance to their academic and social-behavioral development, we focus on grouping, content, and methods, recently highlighted as important areas in which vertical alignment across the pre-K to grade-three continuum should be examined (McCormick et al., 2019). Teachers' grouping experiences capture if and how teachers group children into smaller clusters during instruction or other class activities, which teachers are increasingly likely to do as class-size increases (Blatchford & Russell, 2019). In general, the dominant grouping strategies are whole-class, in which the entire classroom of students is engaged in a common activity; subsets of students organized into larger groupings of 5 to 8 children, smaller groupings of 3 to 4 students, or dyads; and individual work during which children work independently. When children are in a whole-class grouping, activities are generally teacher-initiated and teacher-led, and can encompass a variety of activities such as didactic instruction and classroom discussions that are designed to engage all students in the same activity (Cabell et al., 2013; Zucker et al., 2009). Although whole-class instruction has merits, such as allowing the teacher to monitor all students for participation, it also has been criticized on a variety of grounds, including dominance by the teacher, imbalance in participation across students, and lack of reciprocity in interactions (Burns & Myhill, 2004). Smaller-sized groupings can be used to address these concerns, while also providing opportunities to more closely monitor students' work and provide individualized support (Jacob et al., 2020). Also, individual seatwork by students, representing nearly 40% of the time for third-grade students in one study (National Institute of Child Health and Human Development Early Child Care Research Network, 2005), can provide time for children to work independently on reading, writing, and other content areas. It should be noted that the use of whole-class instruction has generally been viewed as not developmentally appropriate in pre-K and kindergarten (Rathbun et al., 2000), although in one study it constituted almost 20% of children's time in pre-K settings (Fuligni et al., 2012).

In this study, we also examined children's content exposure across the early primary grades, with respect to academic content (literacy/language, math, science, and social studies) as well as arts (arts, music, and dance), and free play. Considerable work has indexed children's exposure to content across the primary grades (e.g., Fuligni et al., 2012; National Institute of Child Health and Human Development Early Child Care Research Network, 2005), indicating that language, literacy, and math instruction tend to dominate classroom instruction, representing about 65% of content in first and third grade classrooms (NICHD ECCRN, 2005). Such work also finds that very limited time is spent on science and social studies and that a non-trivial amount of time is spent on transitions and classroom management, the latter of which is negatively associated with classroom quality. Given the cross-sectional nature of the present study, and the inclusion of classrooms spanning the pre-K to grade-three continuum, we examined variation in academic content across these grades and the extent to which language/literacy and math may dominate children's instructional experiences.

The third and final area of instructional experience we investigated was pedagogical method. Because we relied on observations, our work does not assess teachers' intentions or goals with respect to methods, but rather what was used within the classroom with students. There are numerous pedagogical methods used within primary-grade classrooms, such as independent reading and writing, technology, discussion, and direct instruction. Different methods can be used for different purposes, such as independent reading to enhance reading fluency (Reutzel & Juth, 2014) and discussion for inquiry-based science instruction (Kang & Keinonen, 2018). The purpose of this cross-sectional work was to examine the extent of alignment in teachers' use of instructional methods across the early primary grades.

To sum, this study examined children's instructional experiences specific to grouping, content, and methods across the pre-K and primary grades of schooling. Using a cross-sectional design of 179 pre-K through third-grade classrooms and 1,095 students within these settings, we sought to increase understanding of alignment across these grades using both variable- and person-centered approaches

and addressing three aims: (1) to examine grade-related differences in children's experiences with respect to grouping practices, academic content exposure, and pedagogical practices from pre-K to third grade; (2) to examine whether pre-K to third-grade classrooms formed reliable profiles in terms of instructional practices, and the extent to which grade was associated with these profiles; and (3) to explore potential predictors of instructional-practice profiles, namely classroom quality and children's academic and social-behavioral skills.

Method

Participants

Data were collected as part of the [omitted] study, a five-year cross-sectional and longitudinal study of classroom ecology in pre-K through third grade. Participating classrooms were recruited over two consecutive years for the cross-sectional study; classrooms were drawn from two large Mid-western public school districts through information sessions held in preschools and elementary schools. The select districts were located near the university that was the site of the study, and study personnel contacted leadership in each district to develop memoranda of agreement that specified the target sample, ethical treatment of participants, incentives, and recruitment approaches. Because the districts had relatively few affiliated preschool programs, we recruited from non- and for-profit preschool programs located within district boundaries. Teachers in classrooms who consented agreed to participate in study activities for the duration of one school year. All students in the enrolled classrooms were eligible to participate, and consent packets were sent home via backpack mail. For the longitudinal study, children enrolled in pre-K classrooms in year one and kindergarten classrooms in year 2 were followed over time to third grade.

The present study relied on data collected during the first two years of the cross-sectional study for two consecutive cohorts comprising 183 classrooms. The analytical sample for the present analyses included 179 classrooms (46 pre-K, 46 kindergarten, 28 first grade or G1, 31 second grade or G2, and 28 third grade or G3) with valid classroom observation data. Classrooms averaged 22 students (range =

Table 1. Descriptive statistics of the analytical sample by grade level.

	Pre-K (285 children, 46 classrooms)		Kindergarten (268 children, 46 classrooms)		Grade 1 (170 children, 28 classrooms)		Grade 2 (197 children, 31 classrooms)		Grade 3 (175 children, 28 classrooms)	
	Mean or %	*SD*	Mean or %	*SD*	Mean or %	*SD*	Mean or %	*SD*	Mean or %	*SD*
Teacher and classroom characteristics										
Teacher gender: Female	100.0%		100.0%		96.4%		93.5%		92.9%	
Teacher race: White	95.6%		95.7%		96.4%		96.4%		96.4%	
Teacher ethnicity: Hispanic	2.2%		2.2%		0.0%		0.0%		0.0%	
Teaching certification: Yes	37.8%		97.6%		100.0%		100.0%		100.0%	
Teacher degree: Lower than Bachelor's	22.2%		0.0%		0.0%		0.0%		0.0%	
Bachelor's	64.4%		22.2%		21.4%		21.4%		35.7%	
Master's	13.3%		77.8%		78.6%		78.6%		64.3%	
Teacher's years of experience teaching	13.43	9.12	13.31	8.13	14.02	7.73	14.66	7.96	11.55	7.28
Class size	17.02	3.69	25.09	1.63	22.43	2.44	22.55	2.46	23.25	2.30
Classroom composition: Percent of boys	53.10	11.73	51.56	6.60	50.96	7.91	50.18	7.27	49.32	7.49
Percent of ELL	31.51	36.90	19.77	17.19	13.68	18.94	11.55	16.96	12.73	19.96
Percent of IEP	6.59	16.30	9.02	5.91	9.91	7.25	9.75	8.54	16.04	12.64
Consent rate	70.61	15.92	60.10	13.77	72.47	14.93	72.00	13.56	63.53	13.11

ELL = English Language Learners and IEP = Individualized Education Plan, both according to district administrative data

12–29), and detailed demographic information is summarized in Table 1. Across the 179 classrooms, 1,095 children were recruited and consented (285 pre-K, 268 kindergarten, 170 G1, 197 G2, and 175 G3). Consent rate was approximately 67% across classrooms. Of the study children, 49% were girls, 67% were White, 8% were Black, and 12% were Hispanic/Latino(a). The majority of the children spoke English at home as (one of) the primary language (90%). In terms of socioeconomic status, 45% of children had mothers with a four-year college degree or higher for highest educational level, and the median annual household income was 70,001 USD~$80,000. In the fall of the school year, 7% of the children had an individualized education program (IEP).

Procedures

Data were collected during a series of classroom visits, consisting of four time-points (TPs) over an entire school year. TP 1 and 4 took place in the fall and spring, respectively, where child direct assessments and teacher questionnaires were administered. Specifically, in the fall and spring of the academic year, consented children were administered comprehensive assessments of academic skills, social-behavioral abilities, and peer social preferences. Participating children received age-appropriate storybooks at each assessment as a token of appreciation. Teachers also completed questionnaires in the fall and spring regarding current instructional practices, student peer relationships, and child behaviors. A financial incentive was provided to individual teachers for completing all study activities.

Throughout the second half of the school year (January to May), two classroom observations were conducted (TP 2 and TP 3). At least five calendar days passed between the two TPs, and observations were scheduled for different days of the week, whenever possible. During the first observation (TP 2), each classroom was live-coded for two hours, first using the *Classroom Assessment Scoring System* (Pianta et al., 2008) and then by the Classroom Snapshot (C-SNAP), adapted from the Emerging Academics Snapshot (Ritchie et al., 2001) and descriptions of this tool in the published research literature (Fuligni et al., 2012). The second observation (TP 3) lasted for one hour and only the C-SNAP was scored.

Measures

From among the extensive measures used in the larger study, a subset are of relevance to the present study, namely: (1) two measures of instructional practices (C-SNAP and CLASS), and (2) four measures of children's academic and social-behavioral skills.

C-SNAP

Classrooms were observed twice in the middle of the school year using C-SNAP, a live-scoring tool designed to capture children's experiences and teachers' instructional practices in the classroom. Adapted from prior tools described in the literature (e.g., Fuligni et al., 2012; Ritchie et al., 2001), the C-SNAP consists of 31 dimensions organized into four coding dimensions: Grouping, Leader, Content, and Methods (see Table 2). For the current study, three dimensions (Grouping, Content, and Methods) were examined. *Grouping* captures how a child was situated in a classroom activity (i.e., whole-class, large group, small group, dyad, individual, or none). *Content* focuses on the subjects or skills that an activity intended to teach (e.g., language and literacy, math), but also includes the options of free play for pre-K and kindergarten only and management. *Methods* records the pedagogical tools being used by the teacher (e.g., discussion, text reading, writing). Items within the same dimension are mutually exclusive and exhaustive, such that for a given dimension and coding interval, coders must select one item to code to represent the interval; consequently, for both Content and Methods, a code of "none" was included when no other item was applicable.

In each observation session, the C-SNAP was conducted with four randomly selected children in the classroom. These children were coded over two separate 20-min cycles, each of which consisted of 20 one-minute intervals. During each interval, observers are given 30 seconds to watch the target

Table 2. Classroom snapshot (C-SNAP) domains and dimensions.

Domain	Definition	Dimensions coded
Grouping	Who is the target student interacting with? How many people, students and/or teachers, are in the group?	Whole class Large group (5 ~ 8) Small group (3 ~ 4) Dyad Individual None/other
Content	What is the intended subject the target student should learn from the activity? Is the child transitioning from one activity to another or playing?	Language and literacy Math Science and technology Social studies Arts/music/dance/drama Free play (Pre-K and K only) Management None/other
Methods	How is the student participating in an activity? How is information presented to them?	Direct instruction Discussion Text reading Writing Role playing/acting Worksheet Craft/drawing/coloring Movement activity Video Computer/technology Free play/centers (pre-K and K only), None/other

student, followed by 30 s of scoring time. During each cycle, a target child was observed for five consecutive intervals, and then the coder would move onto the next target child. The coder took a 5-min break between the two cycles. On average, a total of 1,095 unique children were observed over the two classroom visits (mean = 6.1 children per classroom), and a total of 14,290 intervals were scored (mean = 13 intervals per child).

A coding catalog describing the four C-SNAP dimensions, items, and item descriptions was developed by carefully studying the extant literature that had used the Classroom Observation System as part of the NICHD ECCRN studies (e.g., 2005) and analogs of that system (e.g., Fuligni et al., 2012). Prior to working live in the field, all coders participated in comprehensive training on the C-SNAP and its coding catalog, including coding practice sessions and written quizzes. To establish reliability, data collectors were required to achieve 80% or greater exact agreement with a master coder on every dimension, across three gold standard videos. The threshold of 80% was selected because it is considered excellent interrater reliability based on extant sources (Regier et al., 2013). Once deemed reliable, on their first day in the field, new coders were supervised by more seasoned project staff. Ten percent of all observations were double-coded by the assigned coder and the master coder independently while in the field. Coders achieved 93% exact agreement for cohort 1 classrooms and 95% for cohort 2. Finally, to maintain inter-rater reliability during the period of fieldwork, biweekly drift meetings were conducted during each observation window for all active C-SNAP coders. In these drift meetings, coders would code videotaped classroom observations and compare and discuss codes.

Class

The CLASS observational tool was scored during the first observation window (TP 2) in each classroom, before C-SNAP was conducted. We implemented the CLASS on only one occasion based on published reports of large-scale use CLASS prototypes which involved only one observation session (e.g., Pianta et al., 2008; NICHD ECCRN, 2005).

The CLASS tool rates 10 dimensions of interactional quality on a scale of 1 (*minimally characteristic*) to 7 (*highly characteristic*). The ten dimensions characterize three larger domains: Emotional

Support, Classroom Organization, and Instructional Support. For the current study, we only used the domain score for Instructional Support, which encompassed three dimensions (Concept Development, Quality of Feedback, and Language Modeling) because prior work shows that Instructional Support scores relate significantly to children's academic achievement (Keys et al., 2013). The domain score was calculated by averaging the ratings on the three dimensions and ranged from 1 to 7. Coder reliability was established by requiring coders to pass benchmark (80% agreement) on five, gold-standard reliability videos. Interrater reliability was monitored in the field by having approximately 20% of observations independently double-coded. Inter-rater reliability was .92 for Cohort 1 and .90 for Cohort 2.

Child Academic Skills

Two subtests from *Woodcock Johnson III NU Tests of Achievement* (WJ) were used to assess children's reading and math skills in the fall and spring of the year (Woodcock et al., 2007): Letter Word Identification (LWID) and Applied Problems (AP). LWID measures children's word-recognition skills by asking them to identify individual letters and then words as the test progresses. AP measures a child's ability to analyze and solve math problems. The examiner read math problems to the child, and the child was to perform appropriate calculations and give an answer. As reported in the test manual, reliability is 0.94 for LWID and 0.93 for AP. Raw scores from WJ subtests were converted to standard scores based on children's age, with a mean of 100 and *SD* of 15.

Child Social-behavioral Skills

Two measures of social-behavioral skills were implemented. First, children's task orientation was assessed by the *Teacher-Child Rating Scale* (T-CRS), which is an indirect measure of children's problem behaviors and social competence (Hightower et al., 1986) and was administered in fall and spring of the school year. Teachers rated children on 32 statements using a 5-point Likert scale (0 = "strongly disagree," 4 = "strongly agree"). Eight items from the T-CRS were averaged to calculate a composite score of task orientation (e.g., "functions well even with distractions"), which ranged from 0 to 4. Internal consistency (Cronbach's alpha) for the task orientation subscale ranged from 0.93 to 0.94 across TPs and cohorts for the present sample.

Second, children's school liking and avoidance was measured in fall and spring with nine items derived from two tools measuring school liking and avoidance (Ladd, 1990; Ladd & Price, 1987) and loneliness (Asher et al., 1984). Children responded to questions pertaining to their attitudes toward school (e.g., "Do you like to come to school?") on a three-point scale (0 = *Never*, 1 = *Sometimes*, 2 = *A lot*). A mean score was created to represent the overall level of school liking. Internal consistency ranged from 0.71 to 0.77.

Table 3 provides descriptive statistics of children's academic and social-behavior skills, both for the overall sample and separated by grade level.

Analyses

To investigate teachers' instructional practices across grades, we first adopted a variable-centered approach to analyze C-SNAP data, by calculating the percentage of intervals in each category of grouping, content, and methods aggregated across observed intervals at the child level. In addition to descriptive statistics, and given our *a priori* hypothesis that classroom activities would differ significantly between pre-K and kindergarten but not necessarily between kindergarten and first grade, we estimated independent-samples *t* tests to examine potential-grade differences among pre-K, kindergarten, and first grade. We collapsed certain categories of the original C-SNAP variables to create (1) three types of grouping (whole class, individual and group activities); (2) two types of content (language/literacy and math); and (3) five types of methods (direct instruction, discussion, text reading, writing, and worksheet). For these tests, we adjusted for multiple comparisons so that the

Table 3. Child-level academic and social-behavioral measures by grade level.

	All		Pre-K		K		G1		G2		G3	
Measures	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range
Academic												
Reading fall	104.89 (13.76)	49 ~ 154	103.70 (13.15)	57 ~ 150	99.04 (12.26)	64 ~ 154	110.61 (15.63)	63 ~ 145	108.56 (12.64)	49 ~ 139	105.11 (12.23)	69 ~ 126
Reading spring	106.27 (13.90)	55 ~ 170	101.76 (14.83)	57 ~ 170	106.24 (12.97)	72 ~ 148	112.33 (13.99)	71 ~ 150	108.49 (12.02)	55 ~ 133	104.91 (13.03)	69 ~ 130
Math fall	104.20 (13.66)	39 ~ 156	107.77 (12.46)	70 ~ 156	100.90 (12.23)	61 ~ 130	107.31 (12.72)	76 ~ 156	104.17 (14.41)	39 ~ 140	102.18 (15.44)	64 ~ 136
Math spring	105.44 (13.60)	51 ~ 154	104.15 (13.90)	55 ~ 154	104.37 (11.60)	51 ~ 133	105.91 (12.53)	75 ~ 136	108.85 (14.57)	67 ~ 142	104.80 (15.22)	61 ~ 136
Social-behavioral												
Task orientation fall	2.60 (1.01)	.00 ~ 4.00	2.69 (.92)	.38 ~ 4.00	2.64 (.94)	.25 ~ 4.00	2.79 (.95)	.25 ~ 4.00	2.44 (1.06)	.00 ~ 4.00	2.42 (1.16)	.00 ~ 4.00
Task orientation spring	2.60 (1.03)	.00 ~ 4.00	2.74 (.85)	.63 ~ 4.00	2.61 (1.02)	.13 ~ 4.00	2.77 (1.03)	.00 ~ 4.00	2.42 (1.08)	.00 ~ 4.00	2.42 (1.17)	.00 ~ 4.00
School liking fall	1.53 (.37)	.11 ~ 2.00	1.49 (.38)	.25 ~ 2.00	1.49 (.40)	.11 ~ 2.00	1.58 (.36)	.22 ~ 2.00	1.57 (.35)	.22 ~ 2.00	1.54 (.32)	.44 ~ 2.00
School liking spring	1.46 (.41)	.11 ~ 2.00	1.38 (.43)	.29 ~ 2.00	1.44 (.44)	.11 ~ 2.00	1.55 (.39)	.44 ~ 2.00	1.52 (.36)	.56 ~ 2.00	1.49 (.39)	.33 ~ 2.00

Child academic outcomes for reading and math are standard scores from *Woodcock Johnson III NU Tests of Achievement* (Woodcock et al., 2007) with a population mean of 100 and standard deviation of 15. Task orientation based on teacher ratings (0 ~ 4); school liking based on child rating (0 ~ 2).

omnibus alpha level for each contrast (i.e., pre-K vs. kindergarten, kindergarten vs. first grade) was 0.05.

Then, for the person-centered analyses, we explored potential profiles of classroom practice using latent profile analyses (LPA), with indicators representing the percentage of intervals spent in ten major categories of grouping, content, and methods. We compared models with different number of profiles (2 to 6) and selected the best fitting solution based on theoretical expectations as well as multiple statistical indices, including model fit (AIC, BIC, SSABIC; lower is better), the LMR adjusted likelihood ratio test (a significant *p*-value rejects the *k*-1 profile model in favor of the *k* profile model; Lo et al., 2001; Vuong, 1989), and the entropy statistic (values approaching one indicates higher classification accuracy; Celeux & Soromenho, 1996). We then examined the association between profile membership and grade level, as well as the extent to which classroom- and child-level characteristics differed across the profiles descriptively and by statistical tests. For the latter, we predicted a select set of outcomes using regression models for the classroom-level variable of instructional support, and multilevel regression analyses (Raudenbush & Bryk, 2002) for child-level academic and social-behavioral skills. Effect sizes (Cohen's *d*) were calculated along with *p*-values to evaluate the practical significance of the results.

The analytical sample included 179 classrooms and 1,095 consented children. There were no missing data for the observational measures (i.e., C-SNAP and CLASS), although 4% to 14% of missing data existed for the various child assessments. We employed full information maximum likelihood (Arbuckle et al., 1996) in all models to treat missing data in individual variables. Given that the model was correctly specified and the missing-at-random (MAR) assumption is plausible, the estimates derived from FIML should be unbiased (Little et al., 2014).

Results

Grade-Related Differences in Grouping, Content, and Methods

To investigate children's instructional experiences in pre-K to third-grade classrooms, we first examined the average percentage of intervals aggregated across children in the grouping, content, and method categories, as shown in Table 4. In terms of grouping, the majority of observed classroom time was spent on whole-class activities (40%), followed by individual (25%), and small-group activities (17%). For content, 39% of the observed classroom time targeted language and literacy skills, followed by math (13%), none/other (13%), and management (13%). For methods, direct instruction (22%) was the most commonly observed approach used for teaching, followed by text reading (13%) and none/other (13%).

Table 4 also provides a comparison of the observed classroom time among the five grades studied. For grouping, pre-kindergartners tended to spend more time in groups (52% for large group, small group and dyad combined) and less time in whole-class (33%) or as individuals (15%). In kindergarten, children spent a larger share of time in whole-class instruction (43%) and less time in small groups (37%). For first and second graders, there was a further reduction of group time (23% ~25%), along with an increase in individual activities (29% ~ 32%). Finally, classroom time in third grade was dominated by whole-class (49%) and individual (36%) activities, with only 12% of the time spent in groups.

For content, pre-kindergartners spent 49% of the observed time in free play and only 23% of the time in targeted academic subjects (i.e., language and literacy, math, science, and social studies). This pattern changed dramatically in kindergarten, where 60% of children's time was spent on academic subjects, and only 11% on free play. In first, second, and third grade, academic time increased to 70% ~76% on average, with the third grade specifically emphasizing language and literacy instruction (59%).

Table 4. Descriptive statistics of observed classroom activities: grouping, content, and methods.

	All (N = 1093) %	Pre-K (N = 283) %	K (N = 268) %	G1 (N = 170) %	G2 (N = 197) %	G3 (N = 175) %
Grouping						
Whole class	40.1	32.5	40.2	44.2	39.7	48.6
Large group	5.7	9.3	5.3	4.3	4.8	2.6
Small group	17.1	27.6	23.0	11.2	9.9	5.0
Dyad	9.6	14.8	8.2	7.5	10.4	4.7
Individual	25.0	14.9	20.8	29.3	31.8	35.5
None/Other	2.6	0.8	2.5	3.4	3.4	3.6
Content						
Literacy/Language	39.1	14.4	42.7	49.4	43.1	58.9
Math	12.8	3.8	15.8	15.9	19.7	11.5
Science/Tech	3.2	3.4	1.0	3.3	5.9	3.4
Social studies	2.5	1.4	0.9	1.1	6.8	3.1
Art/Music/Dance	1.9	4.5	1.5	2.0	0.3	0.1
Free play/Center	15.3	49.4	10.5	/	/	/
Management	12.5	12.2	15.9	13.0	10.5	9.9
None/Other	12.6	10.8	11.8	15.1	13.7	13.1
Methods						
Direct instruction	22.4	16.4	25.0	24.8	25.4	22.3
Discussion	9.1	6.5	6.2	11.3	10.0	14.7
Text reading	13.1	6.1	10.6	15.2	18.2	20.5
Writing	9.1	2.0	8.9	11.6	14.2	12.7
Role play/Acting	0.1	0.0	0.4	0.0	0.1	0.0
Worksheet	7.6	1.9	11.0	8.2	8.8	9.9
Craft/Drawing	5.2	10.5	6.2	4.8	1.0	0.3
Movement activity	2.4	3.1	2.7	2.9	0.7	2.4
Video	1.3	1.5	1.1	0.7	2.1	0.7
Computer/Tech	4.3	1.7	5.8	5.8	5.3	3.7
Free play/Center	12.6	39.2	10.0	/	/	/
None/Other	12.7	11.0	12.2	14.7	14.1	12.8

% = Mean percentage of intervals in each category, averaged across children; Pre-K = Pre-Kindergarten; K = Kindergarten; G1 = First grade; G2 = Second grade; G3 = Third grade. Large group contains five to eight people; small group contains three to four people. Free play/Center time is coded for Pre-K and K only.

For methods, there was far greater consistency in children's experiences across the five grades, although the third-grade classrooms tended to invest most time in text reading (21%) and discussion (15%). Crafts and drawing coupled with movement also took up modest amounts of classroom time in pre-K (14%), kindergarten (9%), and first grade (8%), but very little amount of classroom time in second (2%) and third grade (3%). Finally, children on average spent 2% to 6% of the observed time using computer or technology across grade levels.

We next estimated independent samples t tests to formally assess the similarities and differences in children's classroom experiences in pre-K versus kindergarten and kindergarten versus first grade. Results from these analyses revealed that individual activities significantly increased from pre-K to kindergarten (p = .003), whereas group activities decreased (p < .001). Meanwhile, instructional content in both language/literacy and math increased, along with the use of direct instruction, writing, and worksheet (p < .001) from pre-K to kindergarten. From kindergarten to first grade, on the other hand, the only significant difference detected was a decrease in group time (p = .004). Academic content exposure (language/literacy and math) and pedagogical methods were no different across these grades. Therefore, pre-K was distinct from kindergarten, whereas kindergarten was only modestly different from first grade.

Profiles of Pre-K to Grade-3 Practices in Grouping, Content, and Methods

To determine whether profiles of instructional practices existed, we conducted LPA based on 10 primary categories at the classroom level. We included three categories from grouping (whole-class, individual, and group activities, the latter-encompassing large group, small group, and dyads), two

from content (activities targeting literacy/language and math), and five from methods (direct instruction, discussion, text reading, writing, and worksheet). These ten are a subset of the 26 possible categories coded for grouping, content, and methods (see Table 2). Our rationale for selection of the 10 that were included is as follows. First, we excluded all of the none/other options, as we cannot effectively interpret the nature of the activities represented by these "catch-all" categories. Second, we excluded categories that were observed less than 5% of the time overall (Content: Science and technology, Social studies, Arts/music/dance/drama; Methods: Role playing/acting, Movement activities, Video, Computer/technology), and categories that were observed less than 1% of the time in certain grade levels (Contents: Free play; Methods: Craft/drawing/coloring, Free play). Also, we omitted free play/center time for inclusion as a category representing content and method as it was only coded for Pre-K and kindergarten. Third, we collapsed three categories of grouping (dyad, small group, large group) into one grouping variable, as we were mostly interested in group activities as a whole, but not the specific type of grouping used. Finally, we excluded management activities as a content category because it did not represent instructional content per se, but rather time in which the teacher spent managing transitions and student behaviors.

Model fit for all solutions (2 3, 4, 5, and 6 profiles) was acceptable (as measured by the entropy statistic) and comparable when examining the Lo-Mendell-Rubin likelihood ratio test (Lo et al., 2001). Theoretical hypotheses and concerns of interpretability led us to select the four-profile solution. Model fit indices for the five different profile solutions appear in Table 5 and descriptives of the final four profiles are shown in Table 6. Analysis of variance (ANOVA) revealed significant and sizable between-profile differences in the majority of the 10 categories ($p < .001$, Cohen's d ranges from 0.83 for math instruction time to 2.9 for whole-class activity time), except for the percentage of worksheet time ($p = .706$).

Table 5. Fit indices for different profile solutions.

Number of profiles	Number of free parameters	Fit indices			Entropy	Smallest group size	Log-likelihood	□□Log-likelihood	Adjusted LRT *p*-value
		AIC	BIC	SSABIC					
2	31	−1852.270	−1753.461	−1851.636	0.868	63	957.135	112.431	<.001
3	42	−2045.688	−1911.818	−2044.830	0.892	27	1064.844	107.709	0.233
4	53	−2152.902	−1983.971	−2151.818	0.933	11	1129.451	64.607	0.123
5	64	−2211.330	−2007.337	−2210.021	0.930	8	1169.665	40.214	0.253
6	75	−2271.592	−2032.538	−2270.059	0.920	8	1210.796	41.132	0.319

AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SSABIC = Sample-Size Adjusted Bayesian Information Criterion; □□ Log-likelihood = change in log-likelihood from *k*-1 profile model to *k* profile model; Adjusted LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio test.

Table 6. Descriptives of four profiles of instructional practice.

Measures	Profile 1: Individual Language and Literacy (n = 19, 11%)	Profile 2: Whole-Class Language and Literacy (n = 90, 50%)	Profile 3: Whole-Class Discussion (n = 11, 6%)	Profile 4: Academic-Light Group Work (n = 59, 33%)
Classroom practice				
Grouping: Whole-class	19% (10%)	53% (13%)	75% (21%)	21% (11%)
Grouping: Individual	62% (10%)	23% (13%)	6% (6%)	19% (10%)
Grouping: Group (large, small, or dyad)	16% (11%)	21% (13%)	17% (16%)	58% (15%)
Content: Language and literacy	67% (20%)	45% (21%)	30% (31%)	22% (22%)
Content: Math	7% (16%)	12% (15%)	39% (27%)	11% (17%)
Method: Direct instruction	14% (8%)	28% (9%)	36% (12%)	14% (7%)
Method: Discussion	5% (4%)	9% (6%)	33% (12%)	5% (6%)
Method: Text reading	25% (17%)	15% (11%)	11% (9%)	7% (9%)
Method: Writing	19% (15%)	11% (12%)	0% (1%)	5% (8%)
Method: Worksheet	10% (10%)	8% (9%)	5% (7%)	8% (12%)

Estimates correspond to percentages and those in parentheses are standard deviations.

As shown in Tables 6, 19 (11%) classrooms were in Profile 1, which we labeled *Individual Language and Literacy*. This profile was marked by intensive language and literacy instruction and solo work by students who were engaged in reading and writing. In these classrooms, two-thirds of content focused on language and literacy with very little on math (7% of observed intervals). For much of the time, children read or wrote (44%), while working individually (62% of observed intervals). Discussion was rarely used as an instructional method (5%). One-half of classrooms (n = 90; 50%) were classified to Profile 2, which we labeled *Whole-Class Language and Literacy*. This profile was characterized by the use of a variety of grouping strategies (53% whole-class, 23% individual, 21% groups) and a high percentage of academic content (45% language/literacy, 12% math). In these classrooms, language and literacy content was addressed nearly half of the time (45% of observed intervals), with modest attention to math (12%). Direct instruction was a prevalent approach to teaching (28% of observed intervals), with little use of worksheets (8%) or discussion (9%). Approximately 6% of the classrooms (n = 11) were in Profile 3, which we labeled *Whole-Class Discussion*. In these classrooms, whole-class activities were frequently employed (75%), a balanced amount of language/literacy (30%) and math (39%) content was taught, and direct instruction (36%) and discussion (33%) were heavily used. In these classrooms, interestingly, writing was not used as a pedagogical approach (0%) nor were worksheets (5%). Children seldom worked on their own (6%). Finally, 59 classrooms (33%) were in Profile 4, which we labeled as *Academic-Light Group Work*. This fourth and final profile featured a relatively low percentage of academic content (22% language and literacy, 11% math) and intensive group activities (58%). Although direct instruction was the major instructional mode of delivery (14%), free play and other non-instructional methods took up 44% of the observed time. Discussion seldom occurred in these classrooms (5%), nor did writing (5%).

Comparing Classroom- and Child-level Characteristics across Four Profiles

With the extracted profile membership comprising four distinct groups, we examined differences among the profiles on a variety of variables. Of initial interest was consideration of how grade was associated with classroom profiles, as depicted in Table 7. Chi-square tests showed that grade composition differed significantly among the profiles ($p < .001$). The Individual Language and Literacy profile and the Whole-Class Discussion profile were dominated by classrooms from first through third grade (100% and 91%, respectively), with little to no representation of pre-K and kindergarten. The Academic-Light Group Work profile consisted primarily of pre-K (56%) and kindergarten (29%) classrooms. Among all four profiles, the Whole-Class Language and Literacy group showed the most even membership across all five grades, ranging from 14% of pre-K classrooms to 31% of kindergarten classrooms. Across the five grade levels, pre-K classrooms were mostly classified to the Academic-Light Group Work profile (72%); kindergarten classrooms to the Whole-Class Language and Literacy profile (61%); first grade to the Individual Language and Literacy profile (32%); second grade to the Whole-Class Discussion profile (36%); and third grade to the Individual Language and Literacy profile (37%).

We also considered the relations among classroom quality and child outcomes for the four profiles (see Table 8). For instructional quality, after controlling for grade level, the Individual Language and Literacy profile was rated 0.49 points lower (on a scale of 1 to 7) than the Whole-Class Language and Literacy profile ($p < .05$, $d = 0.50$), and 0.65 points lower than the Academic-Light Group Work profile ($p < .05$, $d = 0.73$). Although not significant, the Individual Language and Literacy profile was also lower in terms of instructional quality than the Whole-Class Discussion profile ($d = 0.49$). No significant differences were observed in classroom quality among Whole-Class Language and Literacy, Whole-Class Discussion, and the Academic-Light Group Work profiles.

Finally, we examined the extent to which profiles of classroom practice predicted child outcomes in the spring using multilevel regression models, controlling for lagged dependent variables and child demographics (gender, age, race, ethnicity, family income, home language, and IEP status). Outcomes included measures of reading, math, task orientation, and school liking. Children in classrooms in the Individual Language and Literacy classrooms, Whole-Class Language and Literacy classrooms, and the

Table 7. Grade levels and profiles of classroom practice.

Measures		Profile 1: Individual Language and Literacy (n = 19, 11%)	Profile 2: Whole-Class Language and Literacy (n = 90, 50%)	Profile 3: Whole-Class Discussion (n = 11, 6%)	Profile 4: Academic-Light Group Work (n = 59, 33%)
Number of classrooms					
Pre-kindergarten	(n = 46, 26%)	0	13	0	33
Kindergarten	(n = 46, 26%)	0	28	1	17
First grade	(n = 28, 16%)	6	16	3	3
Second grade	(n = 31, 17%)	6	16	4	5
Third grade	(n = 28, 16%)	7	17	3	1
% within each profile					
Pre-kindergarten	(n = 46, 26%)	0%	14%	0%	56%
Kindergarten	(n = 46, 26%)	0%	31%	9%	29%
First grade	(n = 28, 16%)	32%	18%	27%	5%
Second grade	(n = 31, 17%)	32%	18%	36%	9%
Third grade	(n = 28, 16%)	37%	19%	27%	2%
% within each grade					
Pre-kindergarten	(n = 46, 26%)	0%	28%	0%	72%
Kindergarten	(n = 46, 26%)	0%	61%	2%	37%
First grade	(n = 28, 16%)	21%	57%	11%	11%
Second grade	(n = 31, 17%)	19%	52%	13%	16%
Third grade	(n = 28, 16%)	25%	61%	11%	4%

Table 8. Describing classroom- and child-level characteristics by profiles of classroom practice.

Measures	Profile 1: Individual Language and Literacy (n = 19, 11%)	Profile 2: Whole-Class Language and Literacy (n = 90, 50%)	Profile 3: Whole-Class Discussion (n = 11, 6%)	Profile 4: Academic-Light Group Work (n = 59, 33%)
Classroom-level characteristics				
Instructional support	3.04 (0.94)	3.15 (1.02)	3.41 (0.85)	2.92 (0.84)
Child academic outcomes				
Reading fall	112.13 (14.24)	104.91 (13.05)	104.80 (13.50)	101.85 (13.86)
Reading spring	111.98 (14.20)	107.21 (12.86)	106.36 (14.04)	102.85 (14.53)
Math fall	105.65 (13.90)	103.82 (13.95)	103.63 (13.52)	104.43 (13.08)
Math spring	108.95 (13.15)	105.60 (13.56)	105.64 (15.17)	103.97 (13.29)
Child social-behavioral measures				
Task orientation fall	2.63 (1.07)	2.58 (1.05)	2.55 (1.11)	2.64 (0.89)
Task orientation spring	2.59 (1.14)	2.58 (1.06)	2.66 (1.07)	2.63 (0.92)
School liking fall	1.58 (0.33)	1.53 (0.36)	1.46 (0.34)	1.52 (0.39)
School liking spring	1.51 (0.34)	1.47 (0.40)	1.45 (0.43)	1.43 (0.43)

Instructional support based on observations in winter using CLASS, score range is 0–7. Child academic outcomes for reading and math are standard scores based on a mean of 100 and standard deviation of 15. Task orientation based on teacher ratings (0 ~ 4); school liking based on child rating (0 ~ 2). Estimates correspond to means and those in parentheses are standard deviations.

Whole-Class Discussion classrooms scored higher than the Academic Light-Group Work in reading (+2.2 ~ 0.6 points, d = 0.16 ~ 0.19) and math (+1.5 ~ 2.9 points, d = 0.14 ~ 0.27) (see Table 9). For the social-behavioral measures, children in the Group-Based Discussion classrooms outperformed those in the other three groups on task orientation (+0.14 ~ 0.18 points on a five-point scale, d = 0.16 ~ 0.24). No significant or sizable differences were observed in children's ratings of school liking.

Discussion

This study examined children's instructional experiences specific to grouping, content, and methods across the early years of schooling, with a specific goal of examining alignment in instructional experiences across these grades using both variable- and person-centered approaches. Motivated in

Table 9. Effect-size estimates for between-profile comparisons.

	Profile 1 vs. 2		Profile 1 vs. 3		Profile 1 vs. 4		Profile 2 vs. 3		Profile 2 vs. 4		Profile 3 vs. 4	
Measures	Dif.	E.S.	Dif.	E.S.	Dif.	E.S.	Dif.	E.S.	Dif.	E.S.	Dif.	E.S.
Classroom-level characteristics												
Instructional support	−0.49*	0.50	−0.44	0.49	−0.65*	0.73	0.05	0.05	−0.16	0.17	−0.21	0.25
Child academic measures (spring)												
Reading	−0.32	−0.03	−0.39	−0.02	2.20^{+}	0.16	−0.07	−0.00	2.52*	0.19	2.59*	0.19
Math	1.37	0.14	0.79	0.04	2.90*	0.27	−0.58	−0.03	1.52^{+}	0.14	2.10	0.20
Child social-behavioral measures (spring)												
Task orientation	−0.00	−0.00	−0.18^{+}	−0.16	−0.04	−0.07	−0.17*	−0.16	−0.04	−0.07	0.14	0.24
School liking	−0.00	−0.03	−0.02	−0.04	0.00	0.01	−0.01	−0.02	0.01	0.04	0.02	0.09

Profile 1 = Individual Language and Literacy; Profile 2 = Whole-Class Language and Literacy; Profile 3 = Whole-Class Discussion; Profile 4 = Academic-Light Group Work. Dif. = difference; E.S. = Effect size as measured by Cohen's *d*.
* $p < .05$; + $p < .10$.

part by evidence indicating that skills enhanced by preschool participation diminish between pre-K and third grade (e.g., Hill et al., 2015), experts have identified a lack of alignment in instructional practices as a concern. For instance, Vitiello et al. (2020) recently showed there to be significant differences in numerous aspects of instruction when comparing pre-K and kindergarten. As some research suggests, kindergarten today looks more like the first-grade of primary school years (Bassok et al., 2016), designed to provide children with more exposure to academic content on the basis of considerable evidence linking kindergarten readiness skills to future academic achievement (Duncan et al., 2007). Nonetheless, such sharp distinctions between the pre-K and kindergarten context may make children's transition to kindergarten difficult and contribute to stagnant growth over time.

This study improves our understanding of pre-K to grade-three alignment in its examinations of three dimensions of instructional practice across the five grades: grouping practices, academic content, and pedagogical methods. By applying both variable- and person-centered approaches to cross-sectional data representing 179 classrooms, this study yielded three main findings: (1) instructional practices in pre-K are considerably mis-aligned to those in kindergarten across all three dimensions, whereas instructional practices in kindergarten appear to be better aligned to those in first, second, and third grade; (2) more than one-half of pre-K and about one-third of kindergarten classrooms fit a profile of Academic Light Group Work, and children in this profile of classrooms showed less growth in reading and math over the academic year compared with other classrooms; and (3) there was very little balance to content-area exposure across these grades, with instruction dominated by language and literacy, and to some extent, math, with mediocre attention to science, technology, social studies, or the arts.

The first major finding we highlight is that there is significant mis-alignment between instructional practices in pre-K and kindergarten, which is not the case for kindergarten and first through third grade. The pre-K and kindergarten mis-alignment are not entirely surprising given Vitiello et al. (2020) recent study of more than 400 pre-K and kindergarten classrooms, which found that nearly every aspect of children's classroom experiences differed significantly. The present findings replicate Vitiello et al. (2020) study of pre-K and kindergarten classrooms, yet in a different state with little district-supported pre-K. There are compelling observations that coalesce across these studies, including: (1) exposure to language and literacy content in pre-K is modest but increases to about one-half of instructional content in kindergarten; (2) exposure to math content in pre-K is mediocre and increases to about one-fifth of content in kindergarten; (3) whole-class instruction in pre-K represents less than one-third of instructional time and increases to 40% of time in kindergarten; and (4) free play and center time are abundant in pre-K and scarce in kindergarten and grades one to three.

An interesting feature of the present study is that we are able to analyze kindergarten instructional experiences not only in relation to pre-K but also that of first through third grade. The present findings provide strong empirical justification for viewing kindergarten as highly aligned to first, second, and

third-grade experiences. Our results showed that there was little to distinguish among kindergarten, first, second, and third-grade settings in the instructional practices examined, lending support to the premise that kindergarten indeed represents children's first formal academic experience.

There may be benefits to the academization of kindergarten. For instance, studies find that kindergartners' skills in reading and math are strong correlates of future academic achievement (Duncan et al., 2007), and a high level of exposure to academic content in kindergarten may enhance skill development. This may be particularly important for children who arrive to kindergarten behind in the domains of academic achievement and social-behavior and may require considerable support to develop skills in advance of the transition to first grade. Nonetheless, critiques abound concerning the presumed loss of developmentally appropriate practices in kindergarten as these settings become more academic; for Gullo and Hughes (2011a, 2011b) situate the academic orientation of kindergarten as a "crisis" given the apparent lack of play, music, and creativity. In line with this argument, our data do show large increases in frequency of direct instruction and use of worksheets and a large decrease in the amount of free play from pre-K to kindergarten. The observed academic orientation of these classrooms does argue the importance of ongoing research on the optimal design of kindergarten classrooms to meet the unique needs of young children, as well as strategies that support children in the pre-K to kindergarten transition.

The second major finding concerns the Academic-Light Group Work profile, which represents the second most common profile of classrooms (33%). The dominant feature of this profile was the relatively low level of language, literacy, and math content observed, at 33% of observation intervals as compared with 57% to 74% for the other three profiles. Interestingly, this "academic light" profile was predominated by pre-K (56%) and kindergarten classrooms (29%). This finding suggests that a majority of pre-K classrooms were not overly academic, dispelling concerns raised by some about pre-K being too formal and academic (Zigler et al., 2011). This did not appear to be the case for a substantial number of preschool classrooms. This finding suggests that a subset of kindergarten classrooms is more closely aligned with pre-K than those in first grade and beyond, indicating that kindergarten classrooms cannot be viewed monolithically in terms of instructional practices. Interestingly, kindergarten classrooms appeared to comprise two distinct profiles, representing an Academic-Light Group Work or a Whole-Class Language and Literacy profile. These two profiles are particularly divergent with respect to use of whole-class instruction; language, literacy, and math exposure; and use of direct instruction. Importantly, children in the Academic-Light Group Work profile demonstrated fewer gains in math and reading than those in the other groups. Even though our research design is not causal, this result suggests the need to further consider how instructional practices may contribute to (or detract from) the development of early academic skills.

A third finding of note was the observed domination of language and literacy content across grades and, to a smaller extent math, with mediocre attention to science, technology, and social studies. Kindergarten through third-grade children spent about 50% of their time engaged in language and literacy content, with considerable alignment across these grades. Math was relegated to about 15 to 20% of content, and science, technology, and social studies collectively a meager 3% of content. It is disconcerting to see such meager instructional content targeting science and technology in the early grades of schooling. Evidence indicates that achievement gaps in science emerge as early as kindergarten (Curran & Kellogg, 2016), and only grow larger with time (Morgan et al., 2016), which likely could be mitigated if not eradicated with early high-quality teaching of science in the primary grades. The present findings highlights the need to address those barriers that inhibit teachers from incorporating science, technology, social studies and other content into their classrooms.

Related to this third finding is that Profile 2 (*Whole-Class Language and Literacy*) was the dominant profile among the participating classrooms, reflecting the profile of one-half of the pre-k to third-grade classrooms. These classrooms were characterized by whole-class activities (more than 50% of the time) a high percentage of academic content (57% language, literacy, and math), and direct instruction (28% of the time). We speculate that this dominant profile reflected state-level policies specific to third-grade reading, in which children would not advance to fourth grade unless they met certain thresholds

of reading skill on the spring of third-grade reading assessment. Not surprisingly, this profile was most commonly observed in grades 1 through 3.

The fourth and final key finding concerns the Whole-Class Discussion profile, which represents a minority (6%) of classrooms yet a reliable profile in these analyses. About 10% of first, second, and third-grade classrooms were in this profile, which was distinguishable from the other three profiles in salient ways. First, these classrooms featured more math than language and literacy instruction. Second, these classrooms used discussion as a pedagogical tool far more than other profiles, in which it seldom occurred. Third, children in the Whole-Class Discussion classrooms had significantly higher growth in task orientation than children in the Whole-Class Language and Literacy and Whole-Class Discussion profiles classrooms. Discussion, also commonly referred to as collaborative conversations (Kelly et al., 2019) or instructional conversations (Goldenberg & Patthey-Chavez, 1995), is a salient practice for enhancing students' higher-level learning and classroom engagement (Murphy et al., 2009). However, the use of discussion can be challenging for teachers and it can be difficult to generate productive discussions without significant pre-planning. (Murphy et al., 2016). It is therefore interesting that the most salient characteristic of the Whole Class Discussion group was the use of discussion, yet concerning that so few classrooms were represented in this profile. Of interest is that children in these classrooms showed a significant increase in task orientation over the academic year as compared to those in Profile Individual Language and Literacy and Whole-Class Language and Literacy profiles in which discussion seldom occurred. Perhaps ongoing engagement in structured discussions supported growth in task orientation, although it is also possible that classrooms in which children demonstrated increasing task orientation allowed for more use of discussion.

Despite these contributions to the literature, we also highlight several limitations of this work as well as potential areas of future investigation. First, the classrooms in this study were sampled from two large districts in one Mid-western state. Although some study findings coalesce well with research conducted in other settings (e.g., Vitiello et al., 2020), we cannot assure that our results are generalizable to other settings. Second, study observations represented only a fraction of children's classroom experiences over an academic year. The extant literature commonly draw inferences about instructional classrooms from only one or two brief observations (e.g., NICHD ECCRN, 2005), but it is unclear whether study findings would have differed if we observed children more often over the academic year. Finally, this study showed significant mis-alignment between pre-K and kindergarten instructional practices, and strong alignment among kindergarten to third-grade practices. With that said, our study methods did not contribute to understanding of what this level of alignment, or lack thereof, means for students' learning over the primary grades. We view the present paper as an initial step to first understanding alignment across these grades and then to consider how alignment does and does not influence children's academic and social-behavioral development over time.

Future research can build upon these findings in several key ways. First, given the finding of significant mis-alignment between pre-K and kindergarten classrooms, it would be important to learn whether this is complicit in the significant kindergarten-transition difficulties that many children face (Jiang, Justice, Purtell, Lin, & Logan, 2021), as well as the oft-reported convergence of preschool effects (Lipsey et al., 2018). Second, and relatedly, it would be useful to identify whether increasing alignment between pre-K and kindergarten is beneficial to children's learning and kindergarten transition, and exactly how this might be achieved. For instance, would it be beneficial for children to have greater exposure to whole-group instruction in the pre-K year to bolster alignment across these settings? This would be a fruitful area of inquiry. Third, the academic nature of kindergarten settings, as observed for many (but not all) kindergarten classrooms in this study, begs consideration of children's wellbeing in these highly academic settings and assurance that children have opportunities to socialize even in the context of limited free play. Further investigation of this topic may help to relieve concerns among some scholars (and parents) who seek to "reclaim kindergarten" and make it more developmentally appropriate (e.g., Gullo & Hughes, 2011a, 2011b).

To sum, this study examined instructional practices across three dimensions for the first four years of primary schooling – pre-K to grade three. Our work was motivated in part by expanding interest in

the degree of alignment across the Pre-K to grade-three continuum (e.g., Vitiello et al., 2020) and applying both variable- and person-centered approaches to exploring this issue. As children transition successively from one grade to the next starting from age four, it is necessary to fully understand instructional practices characteristic of these grades and how variability in practices from one grade to the next may foster or impede children's transitions and achievement. The present study provides a foundation on which ongoing classroom-focused research can build, including inferential work linking instructional experiences across grades to children's academic and social-behavioral development.

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