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The social and behavioral ecology of mixed-age and same-age preschool classrooms: A natural experiment

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Abstract

Social interaction and task behavior of preschool children in mixed-age (MA) and same-age (SA) groups were studied longitudinally in this natural experiment, which capitalized on one preschool's transition from two SA (separate 3, 4) classrooms to two MA (combined 3/4) classrooms. In contrast to previous research examining MA and SA grouping, which has typically lacked appropriate comparison groups, the present study was essentially able to hold teachers, curriculum, location, teaching philosophy, and participant population constant. A total of 7887 naturalistic, time-sampled, classroom observations on 47 children attending the two classes were conducted over the course of 18 months. Children's goal-directed activity, sustained attention, social affiliation, inappropriate behavior, and affect were reliably recorded using a checklist instrument. Significant age differences in behavior between the 3- and 4-year-olds in SA classrooms were typically eliminated in the context of MA classrooms such that the 3-year-olds in MA classes in several ways were more like 4-year-olds in SA classrooms, and 4-year-olds in MA classes behaved more like 3-year-olds in SA classrooms. The social and behavioral ecology of the MA preschool classrooms changed significantly over time as children became more familiar with one another. Several of the social affiliation advantages of MA grouping that were found (i.e., age and gender desegregation) wore off over time as the school year progressed. The effects of MA grouping on children's social and behavioral development appear complicated. Developmental

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benefits that MA grouping may provide appear to come with some costs, especially for the older children in the classroom.

Keywords: Mixed-age; Preschool; Classroom; Same-age; Early childhood

1. Introduction

Understanding similarities and differences between mixed-age (MA) and same-age (SA) peer interactions among young children is a worthwhile endeavor for both theoretical and practical reasons. In terms of theory, both Vygotsky's and Piaget's works suggest differential effects on children's cognitive and social development for asymmetric (MA) as opposed to symmetric (SA) peer interactions (Bailey, Burchinal, & McWilliam, 1993; Hartup, 1983; Piaget, 1932; Rubin, Bukowski, & Parker, 1998; Vygotsky, 1930/1978). Interaction with SA peers (who are more likely to be equal in terms of knowledge, skill, and power) is thought to provide a unique context for children to engage in and resolve cognitive conflicts with others, thereby stimulating cognitive, social, and moral development (Azmitia, 1988; Piaget, 1932, Tudge, 1992). Interaction with older, more competent children is seen as an optimal context for facilitating cognitive and behavioral development according to Vygotskian and social learning/cognitive theory (Bandura, 1986; Hartup, 1983; Vygotsky 1930–1935/1978). Interaction with younger children is thought to afford older children an opportunity to practice and develop prosocial, self-regulatory, and leadership skills (French, Waas, Stright, & Baker, 1986; Hartup, 1983; Katz, Evangelou, & Hartman, 1990; Messer, Joiner, Loveridge, Light, & Littleton, 1993; Winsler & Diaz, 1995), and, for older socially withdrawn children, an opportunity to facilitate social participation and social skills (Furman, Rahe, & Hartup, 1979; Hartup, 1983). It is important to note in this connection, however, that most of the research exploring the effects of age composition on children's peer interactions has been conducted in laboratory or quasi-laboratory settings (e.g., placing children of various ages or ability levels together in the same room with a task and observing what happens). Less understood are the dynamics of SA and MA peer interactions that occur in naturalistic settings such as the early childhood classroom.

In terms of practice, MA grouping has been enjoying renewed popularity within early childhood education (Katz et al., 1990; Lloyd, 1999). Advocates of MA grouping in early education claim that the MA classroom holds many social and cognitive advantages over SA classrooms by creating a richer and more diverse educational environment, minimizing normative pressures and competition, encouraging prosocial behavior, self-regulation, and social responsibility, increasing children's tolerance for diversity, and decreasing gender segregation (Derscheid, 1997; Elkind, 1989; Goldman, 1981; Katz et al., 1990; Pratt, 1986; Roberts, Burchinal, & Bailey, 1994; Theilheimer, 1993; Whaley & Kantor, 1992). In MA groupings, because a wider range of child competencies is expected in the first place, the teacher is seen as better able to notice and respond to individual differences in children and provide for a more diverse and individually tailored set of experiences than is the case within

SA groupings that might emphasize homogenous, age-related expectations for children (Anderson & Pavan, 1993; Lloyd, 1999).

Empirical support for these claims, however, is mixed (Roopnarine et al., 1992; Veenman, 1995). Although several studies have found that younger children in MA groups, relative to SA groups, play in more complex ways, are more mature behaviorally, and rely on their peers more and their teacher less (Goldman, 1981; Howes & Farver, 1987; Mounts & Roopnarine, 1987), there are also numerous findings that are mixed (Roopnarine et al., 1992). While some have found increased prosocial behavior and less solitary play activities for all children in MA groupings (McClellan & Kinsey, 1999), others have found the reverse to be true (Roopnarine et al., 1992). Others have suggested that the advantages of MA grouping may be present only for the younger children in the classroom (Bailey et al., 1993; Bailey, McWilliam, Ware, & Burchinal, 1993; Byrnes, Shuster, & Jones, 1994; Dunn, Kontos, & Potter, 1996; Roopnarine et al., 1992; Urberg & Kaplan, 1986). Reviews of MA classrooms for older children in elementary school and beyond show that: (a) there are either no differences or a slight advantage for MA grouping, especially in terms of motivation, self-concept, attitudinal, and social adjustment variables and (b) that the advantages are often greater for the younger children than for the older classmates (Gutierrez & Slavin, 1992; Pavan, 1992; Veenman, 1995).

A number of methodological problems and theoretical challenges account for the mixed findings and suggest fruitful avenues for continued research in this area. First of all, much of the research on early MA vs. SA classrooms suffers from the lack of an appropriate comparison group. MA classrooms are often compared to SA classrooms at different centers, with different teachers, different resources, different early childhood philosophies, and different populations of families/children. Also, self-selection biases are likely to be present at multiple levels, as parents who choose to send their children to, and centers that choose to offer, MA classrooms may be distinct in philosophical/pedagogical orientation. Finally, there is evidence that directors and principals often assign their better, more experienced teachers to MA classes (Lloyd, 1999; Mason & Burns, 1996), thereby further complicating comparisons across the two types of classrooms. The present natural experiment avoids many of these methodological problems by studying one center's transition from a SA to an MA classroom organization, thereby largely holding teachers, curriculum, early childhood philosophy, and child population constant.

Secondly, peer interactions and classroom dynamics are known to change over time over the course of the school year. For example, differences in the dynamics of peer interactions between MA and SA groupings have been found to decrease over time as peer familiarity in the classroom increases (Brody, Graziano, & Musser, 1983). However, systematic longitudinal study of change over time in MA classrooms is quite rare and when it has occurred, suboptimal time sampling strategies have been used. For example, Roopnarine et al. (1992) observed indoor free-play activities in two SA classrooms of 3-year-olds, two SA classrooms of 4-year-olds, and two MA classrooms of 3- and 4-year-olds for 1 week in a Fall semester and 1 week in the Spring semester. These investigators found little evidence of change over time in the outcomes explored. However, this could be due to sampling only a small window (1 week) at only two time points over the school year. The present investigation explores

change continuously throughout the school year in the social affiliations and task activities of preschoolers in MA classrooms.

Third, it seems clear that the benefits and/or costs of MA interaction in early childhood programs are likely to depend on what is going on in the classroom, the broader classroom context, and how teachers choose to organize their classroom activities (Lloyd, 1999; Veenman, 1996; Winsler, 1993), rather than appearing as a simple main effect across the board for classroom age composition (MA vs. SA). Winsler (1993), for example, found that the prosocial and cognitive benefits of MA peer interaction in kindergarten classrooms were strongest during classroom activity contexts that were moderately structured by the teacher, as opposed to either completely unstructured (outside free play) or very structured (large group teacher-directed or teacher-selected small group) activities. Observed in the present investigation, therefore, was children's behavior during three different classroom contexts that ranged from teacher-directed, to child self-selected (within parameters), to free-play activities. It seems clear that simple main effects for age grouping (MA vs. SA) that average across many other relevant variables are not expected, and that variables such as classroom context, age of child, and time during the school year are likely to moderate comparisons between MA and SA grouping. The present study, thus, attempts to explore some of these moderating relations systematically while holding constant some of the confounding variables in comparison groups that have gone uncontrolled in much of the previous research in the area.

The following outcome variables were explored in this investigation: children's focused goal-directed (on-task) behavior, sustained attention to activities, social affiliation (whether the child was alone, with a peer, with a teacher), inappropriate behavior, expressed affect (positive, negative, neutral), and peer preference (whether, when given the choice, children's playmates in the MA classrooms were of the same gender or age as themselves). These variables represent a combination of those explored by other investigators as well as some new constructs to this literature (i.e., affect, sustained attention). Children's social affiliation and peer preferences were examined to answer central and obvious questions of interest regarding whether manipulation of the social structure of the preschool classroom influences the topography of children's social interactions and playmate preferences. Children's engagement in sustained and goal-directed activity was selected for study because children's task engagement is not only a predictor of early school competence (Cooper & Farran, 1988) but also an indicator of preschool program quality (Ridley, McWilliam, & Oates, 2000) and thus of interest to the preschool staff. Finally, children's expressed affect and inappropriate behavior were examined as these dimensions contribute to the overall social climate of early childhood classrooms (Howes, 2000; Stipek et al., 1998).

Roopnarine et al. (1992) found that gender segregation occurred more often in SA than in MA groups, which is consistent with earlier work showing that young children in MA company show less same-gender preferences than children in homogenous age groups (Field, 1982). Roopnarine et al. also found that age differences in the developmental level of children's play were minimized in MA classrooms — that is, age differences in play complexity were present for children in SA classes but not for those in MA classes.

However, there were no clear overall advantages of MA over SA classrooms in terms of complexity of play and possibly some costs were present in terms of play complexity for the older children in the classrooms. Such findings, namely that age-related differences in children's behavior disappear within the context of mixed age classrooms, are important for developmental theory as well as they provide clear evidence of the powerful effect that the social context has on children's learning, play, and behavior (Gauvain, 2001), and how social and environmental contexts can lead development forward for children (Berk & Winsler, 1995; Vygotsky, 1993).

The present study asks the following questions: (1) To what extent do children's goal-directed activity, sustained attention, social affiliation, inappropriate behavior, and affect expression differ in MA as compared to SA preschool classrooms, and do such differences depend on children's relative age (e.g., whether they are the older or younger children in the classroom)? (2) When given the choice, how often do children in the MA classrooms interact with classmates of a different age or gender than themselves, is this related to children's own age and gender, and how much does this change over time? (3) To what extent does the social and behavioral ecology of MA classrooms change over time from the beginning to the end of the school year?

2. Method

2.1. Participants

Participants included 47 3- and 4-year-old children (47% female–75% Caucasian, 9% African–American, 16% Asian–American) who attended one of two preschool classrooms over the course of 2 years at one university-affiliated child development center in the southeastern United States. During year 1, participants included all 14 children who were in the "3-year-old room" and all 14 children who were in the "4-year-old room" at the center. At the beginning of year 1 data collection, which started at the beginning of the Spring semester (January), the average age of the "3-year-olds" was 45.4 (S.D. = 4.5, range from 36 to 51 months) and for the "4-year-olds" the mean was 57.1 months (S.D. = 3.5, range from 52 to 63 months). During year 2, participants included all 27 regularly attending, 3- and 4-year-old children at the center, who, at the beginning of year 2 data collection (beginning of school year — September), were on average 50.8 months of age (S.D. = 5.3, range from 42 to 60 months). Eight of the 27 children observed during year 2 were 3-year-olds from the previous year who continued to attend the center. A full range of family socioeconomic levels was present in the sample (Hollingshead index — range = 25–66, $M = 51.35$, S.D. = 10.65) as the preschool stratified its enrollment in the classrooms into three equal thirds: (a) children of university faculty/staff, (b) children of university students, and (c) children of community members. Paternal age ranged from 25 to 52 years ($M = 36.96$, S.D. = 5.44) and maternal age ranged from 24 to 44 years ($M = 33.48$, S.D. = 5.10). Fathers' years of education ranged from 12 to 21 years ($M = 17.21$, S.D. = 2.85) and mothers' education ranged from 12 to 21 years ($M = 16.45$, S.D. = 2.29).

2.2. Setting

The participating preschool program was a relatively high quality, NAECP-accredited, 5 days a week, morning (8:00 a.m. to 12:00 p.m.) program, consisting of two classrooms. Both classrooms were headed by one lead teacher and one graduate student assistant (all female). For one of the classrooms, the head teacher remained the same from years 1 to 2 while the assistant teacher changed, and for the other classroom the head teacher changed and the teaching assistant remained the same over time. The two classrooms shared the same teaching philosophy (see below) and had similar daily schedules, which reliably consisted of certain times each day set aside for three different types of activities: (1) self-selected activities (SSA) (during which children choose to play in one of several activity centers such as the block area, house corner, Lego table, or dress-up area), (2) outside (OUT) play time, and (3) large group (LG) activities (such as circle time, reading, or singing, together as a group).

The center is described both in written, promotional materials and informal teacher interviews as having a "child-centered" early childhood education philosophy (Carlton & Winsler, 1998). Children were encouraged to independently explore their environment and design their own learning and play activities within the boundaries of materials set out by the teacher. The teacher is seen as a "facilitator" — one who chooses the learning materials made available to the children each day, lets children play and solve their own problems as much as possible, does not generally get involved directly with the children's activities, and intervenes only when necessary.

Historically (and during year 1), the preschool had been organized into two, age-segregated classrooms — one "3-year-old room" and one " 4-year-old room." The preschool program, however, citing a desire to provide more diverse social interactions and a more family-like setting for their children, and intrigued by the claims made by advocates of MA grouping discussed above in the introduction, independently (and originally unbeknownst to the experimenters) changed to a MA organization (two classrooms containing a balanced combination of both 3- and 4-year-olds) between years 1 and 2 of this study. Year 1 classroom observations were originally conducted in the context of another study (Winsler, Carlton, & Barry, 2000). After learning of the organizational change at the preschool and the opportunity to conduct this natural experiment, we decided to continue the naturalistic classroom observations into the second year in order to answer the above questions concerning MA vs. SA grouping in early childhood. The center is happy with the MA grouping and still uses this organizational structure today.

2.3. Procedure

A total of 7887 time-sampled naturalistic observations of target children's on-task behavior, sustained activity, social interaction, inappropriate behavior, and affect in the two preschool classrooms were conducted over the course of the 2 academic years. During the SA year (year 1), 2752 observations were carried out over a 10-week period starting in the early part of the Spring semester. During the MA year (year 2), 5135 observations were completed over a 22-week period essentially spanning the entire academic year. Two female research

assistants (one per classroom) observed target children according to a predetermined random order. Observations began after a 3-week introductory period each year during which time children grew accustomed to the presence of the observers in the classroom, observers were trained, the observational checklist instrument was pilot tested, and the reliability of the final observational checklist instrument was established. Observer influence effects were minimized in this study by both the 3-week rapport-building period and the fact that children in these classrooms were accustomed to the presence of observers in the classroom given the center's laboratory responsibilities. By design, observations took place during the three regularly scheduled daily activity periods/contexts (discussed above) in the two classrooms: LG, SSA time, and OUT during recess. The resulting distribution of observations by classroom context was 3383 during SSA (43% of the observations), 2498 during OUT (32%), and 2006 during LG (25%). This distribution of observations represents fairly well the relative proportion of time children in these classrooms spent each day in each context.

The two naïve observers used a behavioral observation checklist to record their observations. To assist in adhering to the time-sampling observation schedule, observers also listened to prerecorded time signals, which were projected via headphones to one ear from an audiocassette recorder attached to their belt. Target children were observed for 10-min periods, with each period consisting of 10 10-s direct observation intervals separated by 50-s recording intervals. Thus, an observer would observe a target child for 10 s, at which time the audio signal would sound and she would then record her observations for that 10-s period on the checklist instrument for the remaining 50 s. Then the audio signal would sound again indicating that it was time to observe the child for the second 10-s observation. This pattern would continue for 10 observations at which time the observer would go on to conduct a series of 10 observations on the next child on the list. During the SA year, each child was observed an average of 98 times, and during the MA year, 182 times. Predominant activity sampling (PAS; Hutt & Hutt, 1970) was used for the social context and activity variables. This means that if more than one type of behavioral class occurred within a 10-s observation interval, observers only coded the occurrence of the predominate behavior that was present for the larger time period during the observation. The following variables were coded on the observational checklist instrument. The variables used in the analyses were the overall proportion of the child's observations in which the particular behavior or code was present.

First, children's *activity* was coded as either explicitly goal-directed or nongoal-directed. Goal-directed activity was defined as behavior by the child, which appeared focused, organized, and had an identifiable goal or end point to the activity. The goal being pursued by the child could either be self-formulated or teacher-provided, but it had to be appropriate (on-task) within the particular classroom context. Examples of goal-directed activity in the context of SSA or included, for example, building a structure out of Legos or some other assembly/construction materials, doing a puzzle, playing a game with rules, or engaging in an organized make-believe episode of 'house.' Nonexplicitly goal-directed behavior in this context included, for example, aimless wandering around the classroom, looking on into another group's activity, repeatedly spinning a puzzle piece around one's finger for the apparent 'fun of it,' and making a transition between one activity and another. Goal-directed/on-task

behavior within LG periods was defined as the child engaged and participating in the LG activity as defined by the teacher.

Children's *sustained attention* was coded by assessing the similarity between the child's activity during one 10-s observation interval and the child's activity during the previous observation period, 1 min earlier. In effect, for the second through 10th observation in each series of 10 observations on target children, the observer coded whether or not the activity in which the target child was engaged during a given observation had been same (in terms of goal, materials, and behavior) as the activity of the previous observation 1 min earlier.

Children's immediate *social context* was also coded. Observers noted, for each 10-s interval, whether the child was alone, with one or more peers, with a combination of one or more peers and a teacher, or one-on-one with a teacher. Children were coded as alone if no other person engaged in the same general activity was within two feet of the target child and there were no social interchanges with another person during the observation. Children were coded as being with a peer if there were one or more other children present who were either doing the same activity in parallel with the target child within two feet or who were physically or verbally interacting with the target child. Children were coded as being with both peer(s) and a teacher if any adult was included as one of the members of a group, using the same criteria as those used above for 'peer.' Children were classified as being exclusively with a teacher if they were interacting one-on-one with a teacher with no other children within two feet of the target child. Due to infrequent occurrence of the one-on-one with teacher category, the latter two social context categories were combined (indicating simply teacher presence) and used in the analyses.

For year 2 (MA classrooms), the gender of the target child's peer was also coded (male, female). Thus, for each observation in which the target child was with a *peer* or with *both* (peer(s) and teacher), the gender of each child in the group was noted. This information was then crossed with the gender of the target child. That is to say, each relevant (only when there was another child present) 10-s observation period was thus coded as containing either children from the same gender as the target child or as containing at least one child of the opposite gender. This was done for year 2 (MA) observations only because in year 1, gender of playmate was not of interest. This variable was added to the observations in year 2, however, because the MA literature suggested less gender segregation in MA as opposed to SA classes and we wanted to assess spontaneous gender segregation in the MA classes.

Similarly, the age category of the target child's peer(s) was also coded as being either a "3-year-old" (a child who during the previous year, when the center held an SA organization, would have been assigned to the 3-year-old room (regular cut-off of being less than 48 months on September 1) or a "4-year-old" (would have already been age four by September 1). Each 10-s observation period (only when a peer was present), thus, was coded as containing either children from all the SA group as the target child ("SA"), or as containing at least one child who was either older (as in the case of the 3-year-old target child) or younger (as in the case of a 4-year-old target child) than the target child ("different-age").

Children's *affect* (positive, negative, neutral) was also coded during the observations. Positive affect was coded if children exhibited one or more overt smiles and/or laughter during the observation. Negative affect was coded if frowning, crying, yelling, pouting or

explicit facial expressions of anger were present. Neutral affect was coded if the child's affect during the 10 s was neither explicitly positive or negative.

Finally, children's behavior during each 10-s period was coded as either appropriate or *inappropriate*. Inappropriate behavior was defined as any intentional action that: (a) did (or was intended to) do physical harm to another person (e.g., hitting, kicking), (b) damaged property or classroom materials, or (c) involved verbal or physical rudeness toward another person (e.g., yelling, name calling, teasing, grabbing...). If one of these behaviors occurred during the observation, the observation was coded as containing inappropriate behavior. If not, the observation was coded as appropriate.

2.3.1. Reliability

Inter-rater reliability for the classroom observations was determined during the last phases of observer training each year, at which time two observers independently rated the same children for 259 10-s observations. Reliability ranged from acceptable to good for all category systems. Percentage agreement across observers was 88% for children's activity (κ=.75), 96% for sustained activity (κ=.90), 89% for social context (κ=.83), 87% for affect (κ=.71), and 100% for inappropriate behavior.

3. Results

3.1. Overview of data analysis strategy

Three types of analyses were conducted corresponding to the three different research questions. First, differences between the MA classes and the SA classes in the overall proportion of observations in which behavior 'X' was observed (averaging across time) were examined at the participant level, including age of child and classroom context as potential moderating independent variables. Second, overall patterns for children's peer preferences in the MA classrooms were examined at the global observational level (collapsing across children and time). Finally, linear change over time (over the course of the entire school year) at the individual child level was examined for children's behavior in the MA classes via individual growth curve modeling (Singer, 1998).

3.2. MA vs. SA comparisons

Table 1 provides the means (and standard deviations) for the proportion of observations for which each of the observational categories was observed, by age (3, 4), age grouping (SA, MA), and classroom context (LG, SSA, OUT). Also provided are the overall figures averaged across the three different classroom contexts. A series of mixed ANOVAs was conducted with *age* (3, 4) and *grouping* (SA, MA) as between-participant variables, and the mean proportion of observations during LG, SSA, and OUT in which each of the observational variables was observed in turn (at the subject level — $n = 47$) as the dependent repeated measure. All statistically significant effects are reported below. However, in the presence of higher-order

Table 1
Means (S.D.) of the proportion of observations in which each dependent variable was observed, overall, by classroom type, by age of child, and by classroom context

	SA classroom								MA classroom							
	3-year-olds				4-year-olds				3-year-olds				4-year-olds			
	LG	SSA	OUT	Total	LG	SSA	OUT	Total	LG	SSA	OUT	Total	LG	SSA	OUT	Total
Goal-directed activity[a,b,c,d,e]	.67	.61	.25	.50	.99	.73	.23	.67	.82	.65	.13	.54	.78	.66	.11	.49
	(.15)	(.14)	(.19)	(.12)	(.01)	(.14)	(.14)	(.09)	(.19)	(.16)	(.08)	(.12)	(.21)	(.07)	(.08)	(.08)
Sustained activity[d,e,f,g]	.74	.60	.29	.53	.98	.63	.20	.62	.78	.55	.30	.54	.73	.59	.26	.51
	(.16)	(.14)	(.22)	(.15)	(.02)	(.15)	(.13)	(.09)	(.20)	(.18)	(.23)	(.19)	(.23)	(.11)	(.22)	(.15)
Inappropriate behavior	.00	.00	.00	.00	.00	.01	.02	.01	.00	.00	.00	.00	.02	.04	.00	.00
	(.00)	(.01)	(.01)	(.01)	(.00)	(.03)	(.04)	(.02)	(.00)	(.01)	(.01)	(.00)	(.01)	(.12)	(.01)	(.01)
Social context																
Alone[d]	.01	.11	.16	.10	.00	.21	.19	.14	.04	.16	.20	.14	.01	.18	.21	.15
	(.02)	(.09)	(.12)	(.07)	(.00)	(.15)	(.11)	(.05)	(.08)	(.06)	(.11)	(.05)	(.03)	(.13)	(.09)	(.05)
Peer(s)[a,b,c,d,e,f,g]	.07	.25	.33	.23	.00	.48	.73	.40	.04	.14	.54	.31	.04	.14	.57	.30
	(.13)	(.14)	(.17)	(.09)	(.00)	(.16)	(.10)	(.07)	(.09)	(.05)	(.11)	(.10)	(.08)	(.06)	(.11)	(.07)
Teacher present[a,c,d,e,f,g]	.92	.65	.51	.67	1.00	.31	.08	.46	.92	.54	.27	.55	.95	.57	.22	.55
	(.13)	(.14)	(.22)	(.11)	(.00)	(.14)	(.07)	(.06)	(.15)	(.15)	(.08)	(.07)	(.11)	(.15)	(.09)	(.10)
Affect																
Positive[b,d]	.20	.16	.31	.23	.20	.26	.28	.25	.11	.10	.16	.12	.20	.13	.14	.15
	(.15)	(.12)	(.17)	(.11)	(.10)	(.12)	(.13)	(.08)	(.09)	(.07)	(.13)	(.07)	(.16)	(.10)	(.07)	(.10)
Neutral[b,d]	.79	.82	.66	.75	.80	.72	.70	.74	.89	.89	.82	.87	.80	.86	.83	.83
	(.14)	(.10)	(.17)	(.10)	(.10)	(.12)	(.13)	(.07)	(.09)	(.07)	(.13)	(.07)	(.17)	(.13)	(.14)	(.14)
Negative[d]	.01	.02	.02	.02	.00	.01	.02	.01	.00	.01	.02	.01	.00	.02	.03	.02
	(.03)	(.03)	(.03)	(.02)	(.00)	(.02)	(.05)	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)	(.04)	(.07)	(.05)

[a] Age effect ($p < .05$).
[b] Grouping effect ($p < .05$).
[c] Age × Grouping interaction ($p < .05$).
[d] Context effect ($p < .05$).
[e] Age × Context interaction ($p < .05$).
[f] Age × Grouping × Context interaction ($p < .05$).
[g] Grouping × Context interaction ($p < .05$).

interactions, only the main effects and lower-order interactions that are still interpretable (i.e., still true across all levels of the other variable) are discussed. To assist in the interpretation of some of the significant three-way interactions, simpler, follow-up univariate ANOVAs were also conducted.

3.2.1. Goal-directed activity

The ANOVA (model described above) on children's goal-directed activity yielded significant effects for age [$F(1,51) = 5.83$, $p < .05$], grouping [$F(1,51) = 4.33$, $p < .05$], the Age × Grouping interaction [$F(1,51) = 8.79$, $p < .01$], context [$F(2,102) = 391.41$, $p < .001$], the Age × Context interaction [$F(2,102) = 5.71$, $p < .05$], and the Age × Grouping × Context three-way interaction [$F(2,102) = 8.14$, $p < .001$]. As would be expected, the context effect reveals that children's behavior was most focused and goal-directed during LG activities (81%), next during SSA (66%), and least while outside on the playground (18%). The Age × Grouping interaction revealed that in age-segregated (SA) classes, there are large age differences in goal-directed activity (4-year-olds engaged in significantly more goal-directed/on-task activities than 3-year-olds), but that these age differences disappeared in the MA classes. Three-year-olds in MA classes engaged in more focused goal-directed activities than the 3-year-olds in SA classes, while 4-year-olds in MA classes engaged in less goal-directed activities than those in the SA setting. The significant three-way interaction simply qualifies the above discussed Age × Grouping interaction by showing that the disappearance of the age differences that was observed in MA classes is only true in the LG and SSA contexts and not true outside during free play.

Because: (a) focused, goal-directed activity is not really expected of preschool children while outside during recess, (b) it makes more sense for this variable to be explored only in the settings that require children to either focus on the LG activity or select a focused activity on their own (SSA), and (c) the same patterns were observed in these two relevant contexts (SSA and LG), the two contexts were combined into one for the purposes of displaying the main Age × Grouping interaction for goal-directed activity in Fig. 1. The corresponding age (3, 4) by grouping (MA, SA) ANOVA revealed a significant age effect [$F(1,51) = 11.74$, $p < .001$] and Age × Grouping interaction [$F(1,51) = 14.09$, $p < .001$]. Three-year-olds in the SA class were on-task 63% (S.D.=.13) of the time during these two contexts (combined) and 4-year-olds in the SA class 85% of the time (S.D.=.08). These age differences disappeared in the MA classes [71% (S.D.=.14) and 70% (S.D.=.10), respectively].

3.2.2. Sustained attention

The ANOVA on children's sustained activity yielded a significant context effect, $F(2,102) = 284.96$, $p < .001$, a significant Age × Context interaction [$F(2,102) = 6.39$, $p < .01$], a significant Grouping × Context interaction [$F(2,102) = 4.89$, $p < .01$], and a significant three-way interaction [$F(2,102) = 8.18$, $p < .001$]. The context effect was simply that children sustained their attention longest on a single activity during the LG setting (81%), next during SSA (60%), and least outside (26%). The three-way interaction revealed that an Age × Grouping interaction for sustained activity existed only during the LG context, univariate $F(1,51) = 9.75$, $p < .01$, and not during SSA or OUT. During LG activities,

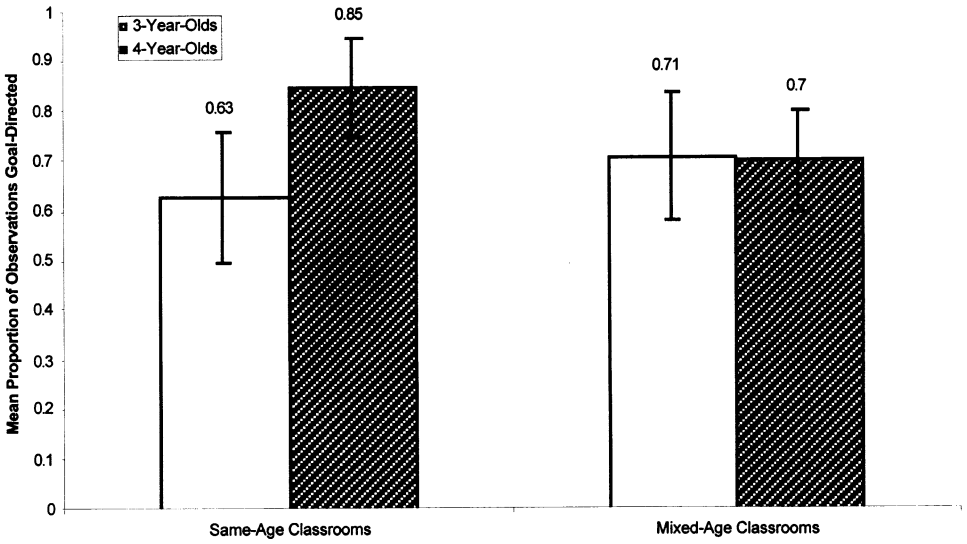

Fig. 1. Amount of time (mean proportions) children were engaged in on-task, goal-directed activity during SSA and LG combined, by classroom type (MA, SA) and by age of target child (3, 4).

significant age differences in sustained activity favoring the 4-year-olds in SA classes were again eliminated in the context of MA classes, and this was mostly due to a large reduction in the sustained activity of 4-year-olds in MA classes (73%) compared to 4-year-olds in the SA setting (98%).

3.2.3. Inappropriate behavior

As seen in Table 1, inappropriate behavior by the children in the classroom was particularly rare in all contexts (0–4% of the observations). No significant effects were found from the ANOVA.

3.2.4. Social context

The proportion of time children spent alone varied significantly only as a function of classroom context [$F(2,102) = 53.42$, $p < .001$], with children obviously spending less time alone during LG activities than during the other two contexts. The ANOVA on the proportion of observations in which children were with a peer, however, yielded significant effects for age [$F(1,51) = 26.80$, $p < .001$], grouping [$F(1,51) = 10.91$, $p < .01$], the Age × Grouping interaction [$F(1,51) = 21.08$, $p < .001$], context [$F(2,102) = 298.57$, $p < .001$], the Age × Context interaction [$F(2,102) = 17.84$, $p < .001$], the Grouping × Context interaction [$F(2,102) = 22.07$, $p < .001$], and the three-way interaction [$F(2,102) = 13.93$, $p < .001$]. The context effect simply revealed that children spent the most amount of time with peers outside (54%), next during SSA (25%), and least during LG (4%). The three-way interaction revealed that there were Age × Grouping interactions for both the SSA [univariate $F(1,51) = 13.31$, $p < .001$] and OUT [univariate $F(1,51) = 27.19$, $p < .001$] contexts, but no significant effects of

any kind during LG activities. Fig. 2 plots the mean proportion of observations children were found to be with one or more peers (during the two relevant contexts in which they are encouraged/allowed to do so — SSA and OUT), by age and grouping. For both the self-selected and outside contexts, the Age × Grouping interaction was such that large age differences observed in age-segregated classes (4-year-olds spent more time interacting with other children than 3-year-olds) disappeared in the MA setting.

Results for teacher presence mirror that for peers above. Significant effects were observed for age [$F(1,51) = 28.29$, $p < .001$], the Age × Grouping interaction [$F(1,51) = 30.77$, $p < .001$], context [$F(2,102) = 393.12$, $p < .001$], the Age × Context interaction [$F(2,102) = 18.59$, $p < .001$], the Grouping × Context interaction [$F(2,102) = 3.98$, $p < .05$], and the three-way interaction [$F(2,102) = 12.74$, $p < .001$]. The context effect, as would be expected, was that a teacher was much more likely to be immediately present with the children during LG activities (95%), next during SSA (52%), and least outside (27%). The three-way interaction again revealed that there were Age × Grouping interactions for both the SSA [univariate $F(1,51) = 21.58$, $p < .001$] and OUT [univariate $F(1,51) = 29.86$, $p < .001$], but no significant effects of any kind during LG activities. The Age × Grouping interactions followed the same patterns for both SSA and OUT — large and significant age differences in the amount of time children spent with a teacher in the SA setting (4-year-olds spending less time with a teacher than 3-year-olds) were eliminated in the MA classrooms.

3.2.5. Affect

Children's positive affect showed only a significant main effect for grouping [$F(1,51) = 14.94$, $p < .001$] and a context effect [$F(2,102) = 5.33$, $p < .01$]. Overall, children

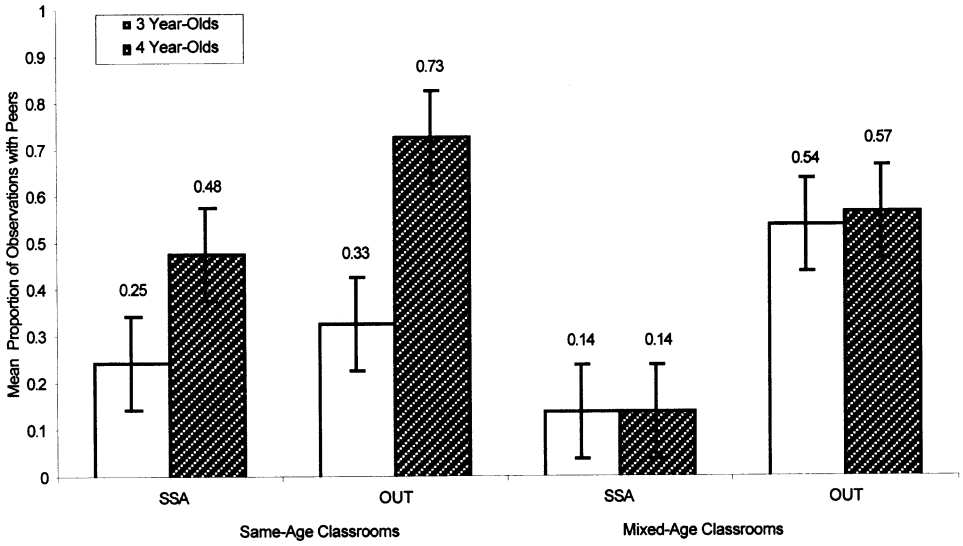

Fig. 2. Amount of time (mean proportions) children spent interacting with a peer during SSA and OUT, by classroom type (MA, SA) and by age of target child (3, 4).

expressed more overt happiness in the SA classrooms ($M = 24\%$ of the observations, S.D.=.09) than in the MA classrooms ($M = 14\%$, S.D.=.09), and children were generally happier outside (22%) than during SSA (17%) or LG (18%). Conversely, neutral affect showed the corresponding grouping [$F(1,51) = 12.94$, $p < .001$] and context [$F(2,102) = 7.90$, $p < .001$] effects. Children's affect was more neutral in the MA classrooms ($M = 85\%$, S.D.=.11) than in SA classes ($M = 74\%$, S.D.=.08), and children's affect was less likely to be neutral outside (75%) than in either SSA (82%) or LG (82%). The only significant effect for children's negative affect was for context [$F(2,102) = 5.72$, $p < .01$], indicating that children exhibited the most negative affect (frowns, scowls, anger, frustration, tears, etc.) outside on the playground (2%), next during SSA (1%), and the least during LG (0%).

3.2.6. Summary of MA vs. SA comparisons

MA grouping in early childhood appears to reduce observed behavioral and/or developmental differences between 3- and 4-year-olds. Age of child and classroom context moderated the effects that MA grouping had on child behavior in that Age × Grouping interactions and three-way interactions involving context, age, and grouping were the norm rather than simple main effects for classroom age composition. In the age-homogenous classroom settings, 4-year-olds were more goal-directed, showed more sustained attention to task activities, spent more time interacting with peers and less time interacting with the teachers, compared to 3-year-olds. These age differences were eliminated in the context of MA classrooms wherein children of all ages behaved more similarly. In MA settings, 3-year-old behavior was more characteristic of 4-year-old behavior in SA settings and 4-year-old behavior was more like that seen by the 3-year-olds in SA classrooms. Next, we turn to the second research question, which has to do with children's spontaneous peer choices within the MA classrooms.

3.3. Peer choices in the MA classroom

For these analyses, the goal was to understand the overall patterns of peer affiliation that were occurring in the MA classroom. How much time did children actually spend with peers of a different age or of a different gender? Thus, for simplicity, and because individual differences across children in peer affiliation were not of interest here, analyses were conducted at the observational rather than at the child level.

3.3.1. Age segregation

Overall, averaging across the entire year and both age groups of children, when youngsters in the MA classes had a choice (i.e., during SSA and OUT), they spent the majority of their peer time (62%) interacting with a peer of a different age (during SSA this figure was 61% and during OUT, 63%). Thus, it appears that a considerable amount of cross-age interaction does spontaneously occur in MA classrooms. However, the amount of mixed age integration observed varied with the age of the target child. For 3-year-olds, 45% of the 1248 observations during SSA and OUT in which they were interacting with a peer, the children were with an older (4-year-old) child. This is significantly less than 60%, which is what is

expected by chance, given that 4-year-olds slightly outnumbered the 3-year-olds (60%/40%) in the classroom, $\chi^2(1, N = 1248 \text{ observations}) = 120.94$, $p < .0001$. Thus, it appears that at least some of the 3-year-olds systematically preferred to play with other 3-year-olds instead of selecting their playmates randomly. The 4-year-olds, on the other hand, appeared to systematically choose younger playmates when given the choice since 3-year-olds were included in 75% of the 1663 observations during SSA and OUT in which 4-year-olds were interacting with one or more children, a figure which is statistically greater than that expected by chance alone (40%), $\chi^2(1, N = 1663 \text{ observations}) = 824.41$, $p < .0001$. The same pattern in which 4-year-olds were more likely and 3-year-olds less likely to interact with a different-age peer was observed when the same analyses were conducted separately by context (SSA and OUT) and gender.

3.3.2. Gender segregation

Overall, averaging across the entire year and both age groups of children, when children in the MA classes had a choice (i.e., during SSA and OUT), they spent 43% of their peer time with a peer of the other gender. However, this figure varied by classroom context with greater gender integration observed during self-selected inside activities (49%) and lesser integration while outside on the playground (35%). During SSA, 3-year-old boys interacted with girls during 49% of their peer interaction observations, which is not significantly different from the 47% predicted by chance on the basis of opposite gender availability in the classroom, $\chi^2(1, N = 399 \text{ observations}) = 0.56$, ns. Similarly, 3-year-old girls [56% opposite gender — not different from the 53% expected — $\chi^2(1, N = 347 \text{ observations}) = 1.43$, ns] and 4-year-old boys [50%, $\chi^2(1, N = 501 \text{ observations}) = 1.46$, ns] were found to interact with an opposite-gender peer during SSA at chance levels. Four-year-old girls, however, during SSA, did systematically seek out other girls as playmates since only 44% of their peer observations included a boy, which is significantly less than the 53% expected by chance, $\chi^2(1, N = 456 \text{ observations}) = 13.83$, $p < .001$.

Outside on the playground (OUT), only 3-year-old boys showed no same-gender preferences with 46% of their play partners being female, which is not different from the 47% chance level, $\chi^2(1, N = 244 \text{ observations}) = 0.05$, ns. The 4-year-old boys and all the girls, however, showed clear same-gender preferences in their choice of play partners outside. Four-year-old boys' partners crossed gender lines only 28% of the time [less than the 47% expected — $\chi^2(1, N = 356 \text{ observations}) = 88.65$, $p < .0001$]. Three-year-old girls' play partners were gender integrated only 43% of the time [less than the 53% expected — $\chi^2(1, N = 258 \text{ observations}) = 11.11$, $p < .001$]. And 4-year-old girls played with an opposite gender child only 28% of the time [less than 53% expected — $\chi^2(1, N = 352 \text{ observations}) = 87.38$, $p < .0001$].

3.3.3. Gender segregation as a function of age of partners

The final analysis conducted relevant to children's peer choices was one to see if gender desegregation was more likely when children were playing with peer groups that contained children from a different age group. Indeed it was. Children in the MA classes were significantly more likely to interact with opposite-gender peers when the peer group they

were involved with at the time was a MA group (47%) than when the group was one of SA children (38%), $\chi^2(1, N = 2911 \text{ observations}) = 19.53$, $p < .0001$.

3.3.4. Summary of findings related to peer choices

A considerable amount of cross-age interaction occurred in the MA classrooms. Both the 3- and 4-year-olds showed a preference for including 3-year-olds in their play groups. The 4-year-old children showed more same-gender peer preferences than the 3-year-olds and the 3-year-old girls showed more same-gender peer preferences than the 3-year-old boys. Children were more likely to interact in mixed-gender groups when the ages of the group members were mixed than when they involved homogenous ages. It is important to note that these overall age and gender-based differences in play partners reported here all change significantly over time during the course of the year in the MA classrooms, the topic to which we now turn.

3.4. Changes over time in the MA classrooms

A series of unconditional (Level 1) and hierarchical (Level 2) individual growth curve (IGC) models was run on the year-long observations conducted within the MA classroom, with each of the relevant observational variables serving as the repeated dependent measure in turn. Individual growth modeling, a person-centered data analytic technique which focuses on individual rates of change over time rather than on group means at particular time points, was ideal for examining change over the course of the year in the MA classroom with these data because of the presence of large numbers of repeated observations, unequal numbers of observations across children, and unequal inter-observation intervals across children — all features with which IGC can deal effectively, as long as the time variable is appropriately specified (Bergman & Magnusson, 1997; Burchinal, 1999; Francis, Fletcher, Stuebing, Davidson, & Thompson, 1991; Singer, 1998; Willett, Singer, & Martin, 1998). The Level 1 analysis estimates two parameters, the intercept (initial status at the beginning of the school year) and the slope or rate of linear change over the course of the school year in the dependent variable of interest and informs as to the goodness of fit for the data following a linear pattern of change over time.

SAS PROC MIXED was used to run these models with a person-period data structure (Littell, Milliken, Stroup, & Wolfinger, 1996; Singer, 1998). As suggested by Singer (1998), first an unconditional Level 1 model was fitted with no person-level covariates. Then age of child was added as a person-level predictor and interaction term in the model to see if some of the additional individual variance in children's growth/change trajectories could be explained by these variables. However, because both age of child and the Age × Time interaction in no case were significant predictors in the level two models, only the unconditional models are reported below for the sake of parsimony. Time was represented as a continuous variable by the day of the year that the particular observation period took place, with 0 being the first day of classes in September (''centered'' at the beginning of the school year). The repeated dependent variable for each child was the proportion of observations during one observation period (10 10-s observations over a 10-min period) that behavior 'X' was observed. Number

of observational periods ranged from 7 to 26 across children ($M = 20.61$, S.D. = 4.15), meaning that the total number of observations creating the data set ranged from 70 to 260 per child.

Table 2 reports the results of the individual growth curves for each of the models. For goal-directed activity, sustained activity, and affect, all the observations overall were used for the models. However, the one case (goal-directed activity) where results were different when conducted separately by classroom context (SSA, LG, OUT) is noted in the table. For the social interaction variables that were only free to vary during SSA and OUT (namely social affiliation, gender integration, and age integration), LG observations were excluded and SSA and OUT observations were combined for the analyses.

3.4.1. Goal-directed activity and sustained attention

As seen in Table 2, overall across all three classroom contexts, the frequency with which children engaged in focused, goal-directed activity did not change in a linear manner across the course of the year and instead remained fairly stable at about 50% of the time. However, within the self-selected classroom context (SSA), the context in which children were expected to engage themselves meaningfully with learning activities in the classroom without much teacher guidance, goal-directed activity increased linearly in the MA classrooms from the beginning (.50) to the end (.71) of the school year. Children's capacity to sustain attention on one activity similarly increased in a linear fashion over the school year in the MA classrooms, starting out at about .38 and ending at about .62.

Table 2
Results of the individual growth curve models examining change over the year in the MA classroom

Dependent variable	Intercept/beginning of year	Slope/per day rate of change	Estimated value, end of year	S.E.	*df*	*T*	*p*
Goal-directed activity							
Overall	.51	+.000055	.53	.000235	548	.23	.81 (ns)
During SSA only	.50	+.000841	.71	.000296	223	2.84	<.005*
Sustained activity	.38	+.000948	.62	.000245	548	3.87	<.0001*
Affect							
Positive	.29	−.00122	.00	.00015	548	−8.12	<.0001*
Neutral	.68	+.001281	.99	.000178	548	7.18	<.0001*
Negative	.03	−.00008	.01	.000071	548	−1.11	.25 (ns)
Social context (SSA and OUT)							
Alone	.36	−.00126	.05	.00021	396	−6.02	<.0001*
Peer(s)	.30	+.000646	.46	.000233	396	2.77	<.01*
Teacher present	.61	−.00060	.46	.000224	396	−2.68	<.01*
Age integration	.85	−.00159	.45	.00037	383	−4.29	<.0001*
Gender integration	.53	−.00066	.36	.00028	383	−2.34	<.05*

* $p < .05$.

3.4.2. Affect

There were no noticeable changes over the course of the school year in children's negative affect, which remained very low (1–3%) throughout the year. However, children's overt happiness expressed during the observations at the beginning of the school year (29%) was gradually and almost completely replaced with neutral facial expressions toward the end of the year.

3.4.3. Social affiliation and peer preference

Children's social partners also changed in a linear fashion from the beginning to the end of the school year. Children in the MA classes were less likely to be alone and more likely to be interacting with one or more peers as the year progressed. Also, children were less likely to be in the immediate presence of a teacher as the school year continued. Of most interest were the results related to the age and gender preferences of children's playmates over the course of the year in the MA classrooms. Fig. 3 demonstrates that although at the beginning of the year children were interacting with children of a different age about 85% of the time, by the end of the school year this figure reduced significantly to 45%. Similarly, at the beginning of the school year, children were spontaneously choosing to interact with peers of a different gender about 53% of the time. This number went down in a linear fashion to 36% by the end of the school year, as is also represented in Fig. 3. Thus, children's spontaneous peer groups in the MA classrooms became increasingly more gender- and age-segregated over the course of the year.

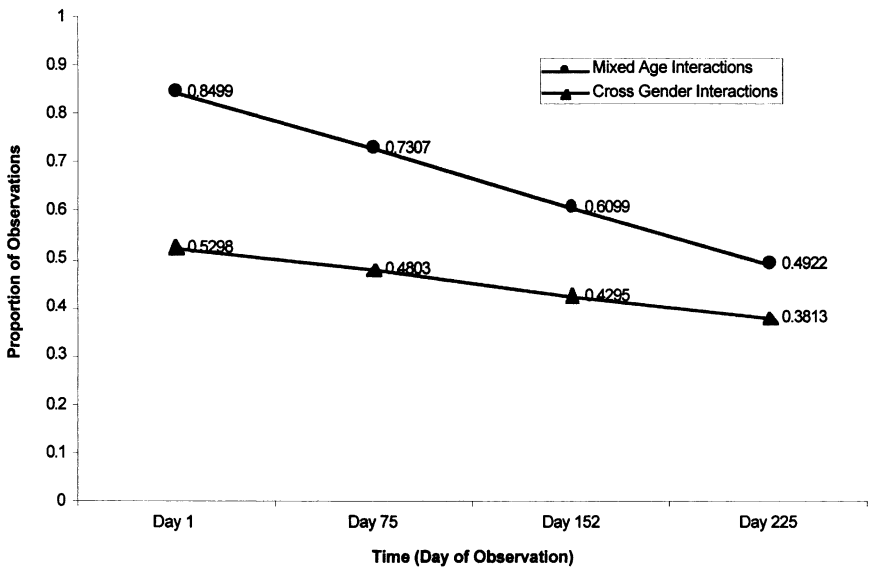

Fig. 3. Change over time in the MA classrooms in the amount of time (mean proportions estimated from the linear models) children spent interacting with peers of a different age and with peers of the opposite gender.

4. Discussion

This study explored the social and behavioral ecology of MA and SA preschool classrooms, and change over time in MA classes, via longitudinal naturalistic classroom observations in the context of one center's transition from SA to MA classrooms. The resulting natural experimental design represents an improvement over much of the work in this area due to the present study's effective control of variance in preschool site, teachers/ staff, pedagogical/ philosophical orientation, center resources, and population of families/ children. The following questions were addressed: (1) To what extent do children's goal-directed activity, sustained attention, social affiliation, inappropriate behavior, and affect expression differ in MA as compared to SA preschool classrooms, and do such differences depend on children's relative age (e.g., whether they are the older or younger children in the classroom)? (2) When given the choice, how often do children in the MA classrooms interact with classmates of a different age or gender, is this related to children's own age and gender, and how much does this change over time? And (3) To what extent does the social and behavioral ecology of MA classrooms change over time from the beginning to the end of the school year?

4.1. Comparing MA and SA classrooms

With regard to differences between MA and SA early childhood classrooms, MA grouping in early childhood appears to have differential consequences for the older and younger children. Statistical interactions between child age and classroom age composition, rather than simple main effects for classroom age composition, appear to be the norm. In general, differences in behavior between the 3- and 4-year-olds were much larger in the SA classrooms than in the MA classes. That is, in many cases, 3-year-olds in MA classes were more similar to 4-year-olds in homogenous groupings while 4-year-olds in MA classes behaved more like 3-year-olds in homogenous groupings. Four-year-olds, in general, engaged in more goal-directed on-task activities and sustained their attention longer on such task-activities than 3-year-olds. However, 3-year-olds in MA classes spent significantly more time in goal-directed on-task activities than the 3-year-olds in the SA classes, and 4-year-olds in MA classes were observed to be less focused and goal-directed than 4-year-olds in SA classes. A similar pattern was observed with regard to children's social affiliation. Four-year-olds, in general, spent less time interacting with a teacher and more time interacting with other children than the 3-year-olds, but these age differences lessened significantly or completely disappeared in the context of MA classes. Thus, in terms of children's social interaction partners and their focused and sustained learning activities, older and younger children in MA early childhood school environments seem to strike a compromise and meet somewhere in the middle.

The fact that child age was associated with increased goal-directed activity, sustained attention, and time with peers and away from teacher (all things that are typically seen as normative age-related developments in the literature) only within the age-homogenous SA environment and not within the MA environment has important implications for devel-

opmental theory and research. This is strong evidence of the important role that the social context plays in children's behavioral development. It is important for developmental researchers to consider both, and distinguish between, age effects and context effects in development. A phenomenon that may have been assumed originally to be due to the age of the child could also, or instead, be due to the context in which children are observed.

The finding that 3-year-old children in MA groupings are stretched a bit behaviorally while this is not the case for the 4-year-olds would appear to give some support to the fears reported by parents who typically prefer their child to be the younger child in MA settings (Lloyd, 1999). However, it is important to point out that these data (nor the data from any other studies for that matter) do not imply that MA classrooms are bad for the older children in such classrooms. First of all, it is not clear that the outcome variables in the present study on which the age-by-age-composition interaction effects were observed (sustained activity, goal-directed activity, time spent with peers and a teacher) are predictive of child competence and later positive outcomes. Secondly, there could easily be other advantages to MA grouping for the older children (like the diversity of social experience afforded by increased gender and age desegregation or other social climate variables not explored in the present study) that balance or outweigh these findings. Clearly, further work would need to be done to ascertain the extent to which there are benefits for the older children in MA classrooms. Finally, the extent to which these findings generalize to children of other ages or in other MA classroom environments is unclear. Although the present single-center, natural experimental design held the advantage of being able to control important variance across programs when comparing MA to SA preschool classrooms, the down side of this design feature is clearly limited generalizability.

The only main effect for classroom age composition observed in the present study was the interesting observation that children of both ages demonstrated significantly more overt positive affect (smiles, laughter) and less neutral affect in the SA classes compared to the MA classes. It is worthwhile to point out in this connection that the lack of overt expressed positive affect does not mean that children were unhappy — their overt affective expression could just have been (and usually was, in fact) overtly neutral. There were no classroom-type differences observed for children's overtly negative affect nor for their inappropriate behavior. Advocates of MA grouping in early childhood education, who emphasize the positive, prosocial benefits of MA classrooms (Katz et al., 1990; Lloyd, 1999), may have predicted that MA environments would elicit more overt positive affect. However, this was not the case here. It is not clear what to make from this finding. To the extent that neutral affect is associated with goal-directed and sustained on-task activity, one possibility that was explored was that this finding could be an artifact of perhaps increased on-task activity in the MA classrooms, but the lack of significant main effects for grouping on these variables (and the trends in the means actually being in the opposite direction favoring the SA classrooms) argue against this possibility. It is possible that young children are simply more overtly happy in SA than MA settings. If this is the case, however, it would not be because they have a strong preference to be with SA peers. As discussed below, the high rates of children spontaneously choosing MA playmates in the MA classrooms suggest that MA interaction is desired by the children. Further, within the MA classrooms, of the observations that contained

overt positive affect during peer interactions, the majority (71%) occurred when the target child was involved with a MA peer rather than a SA peer (29%). Finally, it remains unclear whether frequent overt expression of positive affect by itself is "good" for children — positive affect can of course accompany a wide variety of children's behaviors including both productive and off-task activity and pro- and antisocial behavior. Children's expressed affect in the classroom is not something that has been explored before in the MA grouping literature. This new finding certainly begs for replication.

4.2. Peer preferences in the MA classrooms

An important question to answer within the context of MA preschool classrooms is: How much spontaneous MA interaction occurs in age-diverse classrooms? Do the younger and older children in the classroom play together spontaneously or do age-homogenous play groups dominate? Clearly, whatever developmental consequences MA grouping may have for children will likely require significant interaction across ages to occur. In this study, a considerable amount of cross-age interaction was observed to occur between the children in the MA classrooms. Overall, when play partners were free to vary, children in the MA classes interacted (either in a pair or in a small group) with a peer of a different age 62% of the time. Interestingly, this figure varied as a function of age of the target child. Four-year-olds spent more time (75%) interacting with the younger children than expected by chance alone and the 3-year-olds spent less time with the older children (45%) than chance would predict. Although it is not clear from the present data whether the older children were actively seeking out the younger children for playmates or whether the younger children were actively entering (or tagging along with) older children's activities, this finding suggests at a minimum that at least some of the younger children were systematically choosing not to be with the older kids in the class. Others (Caverly, Lemerise, & Harper, 2002; Lemerise, 1997) have found that among older, elementary age children in nongraded classrooms, the younger children within the classroom tend to be less popular compared to the relatively older classmates. The finding here, however, that 4-year-olds appear to seek out affiliation with the younger children when given the chance suggests that different social dynamics may be at play among preschool age children such that younger children within this context are not disfavored. This conclusion, however, assumes that proximity is positively associated with friendship, something worthy of future investigation among preschool-age children.

Children in the MA classrooms, overall, spent a considerable portion of their time (43%) when given a choice, interacting with a peer of the opposite gender (either one-on-one or within a small peer group that contained a child of a different gender), and such mixed-gender play was more common inside during SSA time (49%) than outside on the playground (35%). Increased gender integration among children in multi-age environments compared to SA settings has been found previously (Field, 1982; Roopnarine et al., 1992) and is typically seen as one of the benefits of MA grouping. Although the relevant data were unfortunately not collected during the first (SA) year of the study, making SA vs. MA classroom comparisons of mixed-gender interaction here impossible, these percentages are considerably higher than other work in the area (Martin & Fabes, 2001) that estimates one-on-one mixed-gender

interaction to be about 10–15% for age-homogenous early childhood classrooms. Further, analyses conducted within the MA classrooms revealed that children's spontaneous play groups were significantly more likely to contain a member of the opposite gender when the play group was heterogeneous with respect to age (47%) than when the group contained only SA children (38%). The present study also replicates previous work (LaFreniere, Strayer, & Gauthier, 1984; Martin & Fabes, 2001) in demonstrating that gender segregation was more common among girls than boys and more common for 4-year-olds than 3-year-olds. Given that gender-segregated play has developmental consequences for children (Martin & Fabes, 2001) in terms of leading to increased sex-stereotypical behavior patterns over time (e.g., increased rough play and aggression for boys), those interested in reducing gender segregation in their classrooms may consider MA grouping as one way to increase mixed-gender interaction during early childhood.

4.3. Change over time in MA classrooms

This investigation was the first to report on MA preschool classrooms continuously throughout the entire school year, and thus contributes much-needed longitudinal data to this area of study. The social and behavioral ecology of MA preschool classrooms indeed changes significantly over the school year. As the school year progressed in the MA classrooms, children's sustained attention on activities increased linearly, and the proportion of time children spent engaging in focused, goal-directed learning activities during SSA periods increased. Children in the MA classes also spent less time alone, less time with a teacher, and more time with their peers as the school year progressed. The extent to which these observed changes over time are due to: (a) development (the children did get older throughout the school year), (b) peers getting more familiar with each other and helping each other work and stay focused, or (c) the teacher getting better at organizing and scaffolding the children's goal-directed activities over time, (or some combination of all three) is, of course, unclear at the present time. Increased peer affiliation and increases in sustained attention and self control are certainly normative, age-related developments known to occur across the preschool years (Bronson, 2000; Howes, 1988; Sarid & Breznitz, 1997).

Children's expressed affect in the MA classrooms became less overtly positive and, instead, more neutral as time went on and children became more familiar with one another. Increases in neutral affect over time could be related to the concomitant increases in focused and sustained goal-directed activity noted above, inasmuch as neutral affect may be more likely during focused learning activities. Nevertheless, a reduction in children's overt expressions of happiness from the beginning to the end of the year, coupled with the finding of less positive affect overall observed in MA relative to SA classes, could be a matter of some concern for early childhood educators implementing MA classes. Further study will have to determine whether this is a phenomenon specific to the particular classrooms observed or a more general trend observed in other MA classroom settings.

Of special note were the findings that age segregation and gender segregation in MA classrooms increase significantly from the beginning to the end of the year. Although the MA classrooms had begun the school year with approximately 85% of children's interactions

being with children of different ages, this figure decreased to 45% by the end of the year. Similarly, after starting off the academic year with children's play being 53% gender integrated, this figure declined to 36% by May. This suggests that as preschool children develop, or as the children become more familiar with one another in the classroom, or both, their play gradually gravitates toward same-gender and SA groupings. Normative, age-related increases in gender-segregated play during the preschool years have been found by others (Leaper, 1994; Maccoby, 1998; Maccoby & Jacklin, 1987; Martin & Fabes, 2001), however, this investigation is the first to show the patterns of linear change in the frequency of mixed-gender peer interactions over the course of one school year within MA preschool classrooms. Although not directly examined in the present study, it could be that the teachers were doing more to encourage MA and mixed-gender interaction among the children early in the year and then gradually stopped doing so over time. Informal impressions from the observers in these classrooms, however, do not support this hypothesis, as they did not become aware of any particular constraints or encouragements placed on children's play partners by the teachers. Instead, children appeared to be free at most times to organize their own activities and play partners in this center. Thus, although MA and mixed-gender interaction are both common overall in MA classrooms, it appears that the novelty of each wears off for the children and, as the school year progresses, they tend to gravitate toward increasing age and gender homogeneity in their peer preferences.

In terms of implications for early childhood practice, the results of this investigation suggest that early childhood teachers in MA settings who are in favor of maintaining age and gender integration in their classrooms may need to experiment with ways of increasing the structures and/or mechanisms in place on children's playmate options. Increases in teacher-provided structure and instructions have been found to increase children's cross-gender and MA play (Carpenter, Huston, & Holt, 1986; Ellis, Rogoff, & Cromer, 1981; Maccoby & Jacklin, 1987). When left to their own devices, it appears children's social affiliation will become more gender- and age-segregated over time (LaFreniere et al., 1984; Maccoby & Jacklin, 1987).

The results of this investigation clearly document that the effects of MA grouping in early childhood classrooms are complex, in that that they often interact with the age of child, they sometimes interact with the classroom context, and they fade over time. Potential benefits of MA grouping appear to come with some costs as well, especially for the older children in the classrooms. Results here echo Roopnarine et al. (1992), who also make the case that the data to date do not support strong claims that MA grouping in early childhood is the superior classroom arrangement for children across the board. As with everything, there appear to be some positives and negatives and this study is no exception. The staff at the center observed here are happy with the social dynamics observed in the MA classrooms and have decided to continue with their MA organization. The present investigation with its natural experimental design has helped to control for some of the variables left to vary in previous research evaluating MA preschool classrooms. It has also helped paint a clearer and more dynamic picture of the social and behavioral ecology of MA and SA early classrooms over time. Future research should explore the effects of MA grouping on other outcome domains not explored in this study (i.e., moral, language, cognitive) and do so longitudinally in order to

get a complete picture of the complimentary developmental consequences of MA and SA interactions in early childhood.

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